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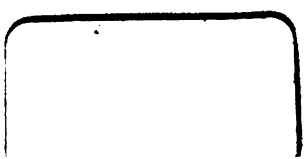

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THE
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ORIGINAL ARTICLES

Authors alone are responsible for the opinions expressed in their contributions

TRANSPORTATION OF WOUNDED

BY CAPTAIN JOHN GILMOUR, M. C., R. A. M. C.

(With seven illustrations)

SINCE the beginning of history, tribes, races and nations have been fighting battles and, although they have left records in the shape of pictures and descriptions of their victories and losses, very little is recorded concerning their wounded.

Till the end of the eighteenth century it was the custom for the medical personnel to be stationed behind the army. While the battle lasted the surgeons attended to those who made their way back to them or were brought in by their unwounded comrades.

After an engagement the wounded were often left on the field of battle to be looked after and nursed back to health by the civilian population of the district.

Barons Larrey and Percy, surgeons in Napoleon's army, were the originators of an organized system for prompt aid to the wounded in war. In 1792 Baron Larrey made a proposal for the establishment of a field hospital capable of active service in front with the advanced troops of the army. This was accepted and the movable field hospital ("Ambulance volante") was organized. These were used in the French Army in the campaign against Austria. It was about this time that companies of stretcher-bearers were organized by Baron Percy, also of the French Army. These institutions seem to have answered their purpose at the time they were employed and were spoken of with praise by general officers on several occasions. In April, 1800, General Lecombe published this general order: "The medical officers have succoured the wounded on the field of battle itself, and have so distinguished themselves by their zeal and devotion that the soldier reverences them and consoles himself when he is wounded because he sees that assistance is given to him with a rapidity hitherto without example."

Another half-century elapsed before the system of collection and

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evacuation of wounded by trained stretcher-bearers became general in the armies of Europe. The British commissioners at the French headquarters in the Crimea, in a report on the military transport, stated that: "The transport of the wounded from the field of battle to a good ambulance, besides satisfying the rights of humanity and sustaining that spirit of confidence in the soldier which, like discipline, should never leave him, has another admirable effect. It obviates the incalculable disadvantage of troops engaged in action leaving their ranks for the purpose of carrying off the wounded."

During the Civil War there was an insufficiency of bearer personnel. In a letter to the Secretary of War, Surgeon General Hammond, writes in 1862: "In accordance with your verbal permission, I have the honour to submit the enclosed project for an hospital corps and to ask your favorable consideration for the same. The need for it is most urgent. In no battle yet have the wounded been properly looked after; men under the pretence of carrying them off the field leave the ranks and seldom return to their proper duties."

The importance of a well-organized transport for wounded cannot be over-estmated. The safety of lives and the preservation of limbs depend upon the proper means of transport being at hand. The period which elapses between the time a soldier is wounded and the time he returns cured to his unit will be shortened if the transport is so organized that the wounded man is brought with the least possible delay under the required surgical care. In addition the speedy removal of wounded during an engagement is not without influence on the combatant ranks generally. The soldier is relieved of a certain amount of anxiety when he knows that assistance is close at hand if anything should happen to him. The presence of large numbers of wounded lying on the field of battle has an injurious effect on the morale of fresh troops which are marching up to reinforce or relieve the troops already in action.

In the present war the problem of transportation of wounded must be tackled and organized weeks and months before the battle actually commences. No one system can be laid down which will be applicable to the western front. In describing the transportation of wounded in modern warfare it will be simpler to describe how the transport is organized and the methods of transport in use on the western front.

The British Expeditionary Force is administered and organized by armies; these are divided into several corps and each corps is made up of two or three divisions. With the headquarters of an army is a director of medical services who is responsible for all medical arrangements in the army. At the corps headquarters there is a deputy director

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of medical services and with a division is an assistant director of medical services. Each of these officers is responsible to the general commanding the formation, that the medical organization proceeds smoothly.

When a battle takes place on the western front one or two armies may be engaged, and close coöperation between the staff of the army, corps and division is required to insure that a regular evacuation of wounded takes place. The assistant director of medical services makes his arrangements to get the wounded of his division from the firing line to the field ambulance. The deputy director of medical services of the corps removes the wounded from the field ambulances to the casualty clearing station. (The casualty clearing station in the British Army corresponds with the evacuation hospital in the American Army.) The director of medical services at the army headquarters arranges for hospital trains to clear the casualty clearing stations to the general hospitals at the base.

The assistant director of medical services of the division, in making his arrangments for the transport of the wounded from the front line to the field ambulances, must work closely with the other divisional staff officers. He must obtain sufficient personnel to act as stretcher-bearers. He must know which are "up" trenches and which are "down." Trenches cannot be blocked by wounded being carried down when troops and ammunition are being taken up. He must know the routes of the trench tramways and Decauville railways so as to utilize these important methods of transport and so avoid long carries by men. He must arrange for the use of the empty returning trucks, so he must know when ammunition, etc., is being sent up. In the event of an advance, these light railways and trench tramways are pushed on behind the troops; he must therefore know where they are going and arrange his collecting posts at the most suitable sites. If it is possible to use roads, he must know which roads are suitable for motor transport and which for horse-drawn transport. All routes must have proper directing posts or flags at crossings so that the unaccompanied, walking, wounded men may know which way to go. All medical posts must be distinctively marked.

The deputy director of medical services at the corps headquarters arranges for the transportation of wounded from the main dressing station to the casualty clearing station, and also assists by sending extra transport to clear the wounded from the advanced dressing stations to the main dressing station if any strain or congestion is occurring at any point. He also arranges for the evacuation of the lightly wounded from the "walking wounded post" to the casualty clearing station. This is done in conjunction with the staff officer of the Quartermaster

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General's branch of the general staff at the corps headquarters. This evacuation is carried out by means of motor omnibuses, char-a-bancs or trucks. In field service manuals, empty returning supply wagons are directed to be used for bringing back lightly wounded men, but in actual practice, and in the first two or three days of the battle, these supply wagons are not there. Sufficient rations have already been brought up to last two or three days, and it is in the first few hours of the battle that the largest number of lightly wounded men are met with. During this time motor char-a-bancs and omnibuses are fully occupied bringing up fresh troops, and the number of these vehicles which can be allotted for the transport of wounded is not sufficient to complete the evacuation unaided. This fact must be kept in mind when choosing the site for a "walking wounded post." It should be, if possible, close to a main road so that the empty returning transport may be made use of. Empty returning ammunition trucks are usually available after the first few hours.

The route to be taken by the motor ambulance cars between the advanced dressing station and the main dressing station and between the main dressing station and the casualty clearing station must be worked out in conjunction with the assistant provost marshal at the corps headquarters. He is the officer responsible for the regulating of traffic on the roads, which are always congested during active operations. Ambulance cars should never be allowed to run in convoys; single cars are much easier to handle by the traffic officers. They can be passed through a body of marching troops without halting the whole column, and they are much speedier when running alone.

Ambulance cars should always be fully loaded up before being sent off. The evacuation will break down during active operations if the accommodation is not utilized to the utmost.

The evacuation from the casualty clearing station to the base by means of hospital trains is arranged by the director of medical services with the director of railway transport at the army headquarters. This is the most important link in the chain of evacuation. Any breakdown here will affect the whole of the evacuation scheme and the casualty clearing stations and field ambulances will be crowded out with wounded.

During periods of inactivity when the normal trench warfare is in progress, the evacuation of wounded is easy and rapid except for unusual local conditions. When a man is hit in the trenches the stretcher bearers go to his assistance. The first field dressing is applied and the man is accompanied or carried to the headquarters of the medical officer in the battalion aid post. This is a dugout in the second or third

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line of trenches. From there he is taken by the battalion stretcher-bearers to the advanced dressing station, or, if the distance is great, to a collecting post. This part of the journey is made by hand carriage or trench tramways by the battalion stretcher-bearers. From the advanced dressing station or the collecting post the field ambulance takes charge of the wounded man. If his condition is not serious he may be detained till night, when it is possible for motor ambulances to come up and evacuate the wounded. If the condition of the wounded man is so serious that he cannot be detained, he is taken by wheeled stretcher to the nearest point to which an ambulance car can advance without attracting the attention of the enemy and from there to the main dressing station of the field ambulance. This stage of the evacuation is performed by the ambulance cars of the field ambulance. From the main dressing station to the casualty clearing station, the cars of the motor ambulance convoy do the transportation. This evacuation is arranged at fixed hours once or twice a day. The officer in charge of the field ambulance notifies the commander of the motor ambulance convoy how many patients he has requiring transportation, whether they are officers or of other ranks, and how many lying and sitting. The motor ambulance convoy removes infectious cases once a day from the field ambulance to the special infectious hospital.

The methods of transport in use on the western front may be classified as follows: (1) by men, (2) by conveyances carried by men, (3) by conveyances wheeled or drawn by men, (4) by conveyances carried by animals, (5) by conveyances drawn by animals, (6) by mechanical transport, (7) by railway transport, (8) by water transport.

1. BY MEN

One soldier can assist in the removal of another by any of the following means:

1. *In the arms.*—If the wounded man is not too heavy he can be carried like a baby. The left arm is passed under the knees and the right arm is placed round the waist of the injured man, who puts his arm round the bearer's neck. If the injured man is unable to stand it is almost impossible to lift him into this position unaided.

2. *Pick-a-back.*—If conscious and able to hold on, the injured man climbs on to the back of the bearer, who kneels on the ground.

3. *The "Firemen's lift."*—This requires great physical strength to get the patient into the proper position, but is very useful in carrying a helpless or unconscious man over rough ground.

4. *By pulling along the ground.*—It is sometimes necessary to pull an injured man into cover. This is done by passing the hands below

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the armpits, raising him and pulling him along head first. If more than one bearer is available the wounded man may be carried by means of—

(*a*) *The fore and aft carry.*—One bearer, kneeling behind the injured man, passes his hands below the man's armpits and clasps them in front of his chest. The other bearer stands between the patient's knees and, bending down, catches hold of them. Both bearers then rise together.

(*b*) *The two-hand seat.*—The bearers stand on either side of the wounded man and each passes a hand below his buttocks, hooking their fingers together beneath him. Each bearer places his disengaged hand on the other bearer's hip so forming a back support.

(*c*) *The four-handed seat.*—Each bearer seizes his left wrist with his right hand and by grasping the wrist of the other bearer with the disengaged hand, a square seat is formed. The patient should have his arms uninjured for this method of transport, as he is required to hold on by passing his arms round the bearers' necks.

If three bearers are available, the bearers place themselves on one side of the injured man, kneel beside him, one bearer passes his hands below the man's knees, another below his hips and the third supports the chest and head. All then rise together.

2. BY CONVEYANCES CARRIED BY MEN

The stretchers in use on the western front are the Ambulance Stretcher Mark 11, and the trench stretcher. Improvised stretchers are seldom seen and should never be necessary if adequate arrangements have been made beforehand. The ambulance stretcher is 7 feet 9 inches long overall, 1 foot 11 inches wide, and weighs 30 pounds. It is similar to the litter in use in the United States Army.

Normally sixteen men are attached to each battalion medical officer as stretcher-bearers. These men are drawn from the battalion. They carry no arms while employed as stretcher-bearers and are trained in first aid. Formerly the bandsmen were trained for these duties, but battalion bands no longer exist. During periods of active operation the number of stretcher-bearers requires to be greatly increased. Prisoners are also used to carry wounded to the advanced dressing stations. No work is heavier than stretcher carrying for long distances and over difficult ground. Immediately after an advance, long carries are always necessary as the roads are completely smashed up by shell fire and impassable for wheeled transport.

It is essential that a sufficient number of stretchers be available for all casualties requiring them. To insure this, numbers of stretchers

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must be collected in dumps at all medical posts so that when the bearers bring down a loaded stretcher an empty one is taken back by them. During a battle the wastage in stretchers is considerable. It is not advisable to move a man from a stretcher on which he is first placed until he occupies a hospital bed. Similarly, ambulance cars which bring down stretcher cases are returned with the same number of stretchers. This applies also to blankets, hot water bottles and Thomas splints.

The stretcher is carried by two bearers who walk "out of step" to prevent the stretcher swinging. The stretcher should never be carried on the shoulders. Owing to the length of the stretcher it is often impossible to carry it loaded along a narrow trench and past the projecting traverses, in consequence the trench stretcher has been introduced. On this the patient assumes a semi-recumbent position, with the feet hanging down. Owing to its short length it is easily carried round sharp corners. It is not popular with stretcher bearers. Trench stretchers are not used when wounded can be carried above ground.

Improvised stretchers have been made in various ways:

1. *The Blanket Stretcher.*—This is improvised by means of two rifles and a blanket. The blanket is first placed under the patient. A rifle is then placed on the edge of the blanket on each side of the man and rolled up in the blanket till the rifles covered by the blanket touch him. The butt ends of the rifles should be at the patient's head. When the stretcher is lifted the patient's body is level while the legs hang down. A similar contrivance can be made by means of a pair of puttees instead of a blanket. The puttees are knotted to the rifles and form nine cross bends from muzzle to butt. The rifles are about 15 inches apart.

A temporary trench stretcher can be made of a tunic and two rifles. The sleeves of the tunic are turned inside out and the tunic buttoned up. A rifle is now passed down each arm hole and the stretcher is ready for the patient. The great coat may be used for the same purpose.

An ingenious trench stretcher has been designed by Captain Stirling, Royal Army Medical Corps. This stretcher is very light, simple, cheap and easy to make. The construction of the stretcher prevents the patient from slipping. Both bearers have their hands free to steady themselves when passing along a slippery trench. The stretcher is constructed of strong, broad webbing, and is composed of two sets of braces and a body. There are no poles. It can be folded and carried in a haversack. It is operated by two bearers.[1]

[1] *R. A. M. C. Journal*, Vol. 28, page 496.

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3. BY CONVEYANCES WHEELED OR DRAWN BY MEN

In trench warfare the distance between the medical aid post of the battalion in the line and the advanced dressing station of the field ambulance may be as much as two miles. The journey is made for the greater part down the communication trenches where careful walking is necessary. These trenches have a flooring of duck boarding which is about half the width of the trench. In muddy weather this becomes slippery, uneven, and often broken, with the result that some contrivance becomes necessary to assist the stretcher bearers and make the transit safer for the wounded men. Wheeled stretcher carriers can only be used in wide trenches where the duck board flooring extends the whole width of the trench. Single wheeled stretcher carriers have been devised which are pushed like a wheelbarrow, but the stretcher bearers dislike them as the wheel is apt to skid off an uneven duck board, and if the wheel is placed in the middle of the stretcher it requires two bearers to balance the contrivance. Trench tramways are used to a large extent on the western front. There are two gauges, two feet and one meter gauge. These tramways do not reach the battalion aid post but the distance between them is not great as a rule. On the two foot gauge tramway, light trolleys carrying two stretchers are used to transport wounded. These trolleys are wooden frames on a four wheeled bogey. The stretchers are carried one above the other. The trolley is pushed by two stretcher bearers. The one meter gauge tramway runs in the sunken roads, and over the open ground and can take trolleys carrying four stretchers, two above and two below. They are heavy to push but the work is much lighter than carrying the stretchers by hand. The later part of the journey may often be made on the road and here wheeled stretcher carriers are used. Wheeled stretcher carriers offer a small mark to the enemy and can be used during the day where it would be impossible to bring ambulance cars. There are several patterns of wheeled stretcher carriers. The old pattern, the Brooke-McCormack, consists of an under carriage made up of two light wheels with steel spokes and solid rubber tires. On the axle are two eliptical springs to which is attached a light wooden framework forming the carrier proper of the stretcher. To this the stretcher is clamped. Two iron supports are provided, one at each end and on opposite sides of the carrier. These are lowered when it is desired to place the stretcher on the carrier or to remove it. The carriage meanwhile remains perfectly still. When the carriage is in motion, the iron supports are turned up and lie along the respective sides of the carrier where each rests in a small clip. The carrier is not strong and the wheels are inclined to buckle on bad roads.

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(To face page 8.)

AMBULANCE CARS ON TEMPORARY RAILWAY

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OUTSIDE AN ADVANCED DRESSING STATION

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FLAGSTAFF. ADVANCED DRESSING STATION.

A LOADED STRETCHER, IN THE TRENCHES.

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DETACHABLE WHEELS FOR STRETCHER

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OVERHEAD TROLLY IN THE TRENCHES

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DRESSING A WOUND IN THE OPEN

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The more modern type is much stronger. It has bicycle wheels with pneumatic tires. The axle is hinged so that the wheels can be approximated to save space in storing or packing. It is well sprung and stands rough usage well.

The Lewis gun carriages which are no longer used by the British Army have been modified to form stretcher carriers. All superfluous parts are removed, leaving the wheels, axle and iron framework. To the framework are fitted springs and a wooden carrier in which the stretcher rests. They are very strong and have proved useful.

The only contrivance on the western front drawn by men along the ground is the "mat stretcher." This has been improvised as a result of the modern condition of warfare. It is used to draw out men who have been injured in tunnelling, mining or countermining operations, where the tunnel is too low to allow a stretcher to be carried. It consists simply of a thick mat made of vegetable fiber about 8 feet long; at one end are two rope loops. The injured man is placed on the mat and is pulled out of the tunnel by means of the rope loops.

4. BY CONVEYANCES CARRIED BY ANIMALS

It is possible to transport wounded either lying or sitting on mules. In the first case stretchers are used, in the second cacolets. The method is used by the French Army where the ground is hilly and wheeled transport impossible. It is uncomfortable for the wounded as they are much shaken; also the animals are liable to slip and fall when going over difficult tracks.

Cacolets are chairs which are constructed so as to be hooked on either side of the pack saddle of a mule. They have a framework of iron with a movable back rest to which is fixed a band which is passed round the patient. At the outer side is an arm rest. There is also a foot rest. These parts fold together close up to the side of the mule when not in use. The wounded are seated parallel to the animal and facing the same direction.

The stretchers for mule transport have an iron framework to which canvas is laced. They are suspended in pairs at the sides of the mule. They require to be carefully loaded and balanced.

The authorized load of a pack mule is 160 pounds, so that it is impossible to transport two wounded men in cacolets or litters any long distance.

5. BY CONVEYANCES DRAWN BY ANIMALS

At the beginning of the present war in Europe, the horse-drawn ambulance wagon was the chief means of transport of wounded in the British Army. These have been largely replaced by motor propelled

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vehicles and it has been proposed to abolish them entirely. At present in each field ambulance there are seven motor and three horse-drawn ambulance wagons; the latter are used chiefly to collect sick from camps near the field ambulance station. When active operations are in progress they often advance close up to the line at night and bring down wounded. It is said that the horses are able to avoid the shell holes on the roads in darkness. If the leading pair drops into a shell hole the consequences are not so serious as a similar accident to a motor ambulance car. It is a slow and uncomfortable method of transportation and quite unsuited for modern warfare. No horse-drawn vehicles could now deal with the numbers of wounded after a heavy fight unless they were so numerous that they would block the roads for all other transport.

There are three types of horse-drawn ambulance wagons—Mark V, Mark VI and Mark I Light Ambulance wagon. The Mark V and Mark VI types are very much alike. They are large heavy vehicles which carry four patients on stretchers or twelve patients sitting, or two on strechers and four sitting. Lockers for medical stores, medical comforts, etc., are placed below the driver's seat and at the front end of the interior. Fittings are also provided to carry thigh splints above the front lockers. A water tank is secured under the rear of the vehicle. The wagon is fitted with bale hoops and a canvas cover.

The Mark I light ambulance car is much smaller and lighter than the previous types. It is intended for rapid movement and for work with the cavalry. It is constructed to carry two patients on stretchers or eight sitting, six inside and two outside.

Horse-drawn general service wagons are occasionally used to carry lightly wounded men, but this is more of the nature of a "lift" than a recognized and routine method of transport.

Horses or mules are frequently harnessed to the trolleys on the 1-meter gauge trench tramway carrying patients.

6. BY MECHANICAL TRANSPORT

Motor transport provides the best means of transportation of wounded from the front to the hospitals behind the line. It is speedy and comfortable. With relays of drivers the cars can be worked continuously in periods of stress. At night they can proceed close up to the line.

In each field ambulance there are seven ambulance cars; of these five or six are heavy cars and one or two are light cars. The heavy cars are of the English type. Owing to the broken-up state of the roads in the forward area slow driving is necessary, but if the ambulance car is

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heavy and well sprung the journey is not uncomfortable for stretcher patients. Each unloaded car carries as equipment four stretchers folded up, eight blankets in summer and twelve in winter. In addition, in some armies a Thomas splint and suspension bar are carried in each car. The heavy type of ambulance car has accommodation for four stretcher patients, or two stretcher patients and four sitting, or eight sitting. The cars are heated by passing the exhaust gases in pipes around the interior of the car. A splinter-proof car for the better protection of the occupants has been used in France. The hood is covered with a strong wire network which extends down in front and at the sides of the driver. It causes a great increase in the weight of the car and is no real protection against anything but the smallest splinters.

The motor ambulance convoy is a unit consisting of 50 ambulance cars. It is made up of three sections, each self-contained, of which any one can be detached for duty. In addition to the personnel of drivers and orderlies, there is a mobile workshop mounted on a truck with a staff of mechanics who can effect all ordinary repairs.

Motor trucks, omnibuses and char-a-bancs are used during active operations to convey the lightly wounded from the "walking wounded post" to the evacuation hospital. A number of these vehicles are allotted to the medical services at these times. When 3-ton trucks are used, seats are fitted round the sides and small ladders are constructed to assist in loading. Each truck will carry twenty men. Motor omnibuses and char-a-bancs are more comfortable as seats are already fitted. All vehicles temporarily used for the carriage of wounded have a distinguishing Red Cross flag exposed prominently in front so that the traffic-regulating guards may recognize them and give them right of way on the roads. Motor bicycles with a side-car attachment to carry a single stretcher are used by the French Army, but are not in use on the British front.

7. BY RAILWAY TRANSPORT

Ambulance trains are divided into three categories: (*a*) Permanent ambulance trains, (*b*) temporary ambulance trains, (*c*) improvised ambulance trains.

Permanent ambulance trains, or, as they are often called, "hospital trains," are specially built and equipped for the purpose of transporting serious cases. They consist of special ambulance coaches fitted with tiers of cots, coaches for sitting cases, dispensary, pack store, kitchens, operating theater and coaches for personnel and supplies. There is corridor communication throughout. The coaches for the sick are so constructed that wounded can be loaded and unloaded with ease. Each hospital train has a permanent staff.

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Temporary hospital trains are made up of the ordinary vans or coaches equipped with some arrangement for carrying sick and wounded. There are various specially devised fittings for this purpose. The Bréchot-Desprez-Ameline apparatus consists of an iron framework which carries three stretchers on springs in tiers. Four of these can be carried in a French van of the closed type. They are fixed in the corners of the van. If necessary, a fifth can be placed transversely in the center. This gives accommodation for 12 or 15 stretcher cases in each van.

In the Zavodovski method the stretchers are suspended from cables which stretch across the van and are anchored by ropes to rings in the floor of the vehicle. By this method 8 or 10 stretchers can be carried.

Improvised hospital trains are composed of vehicles which have brought up stores, etc., to the front and are utilized on the return journey to take back wounded. The Decauville light railway system, which is largely used for carrying heavy ammunition from the railhead to the guns, has been of valuable assistance in evacuating wounded from the advanced dressing stations. Each truck carries two stretchers, the handles of which rest in grooves in the ends of the truck. No extra fittings are required.

8. BY WATER TRANSPORT

Water transport is well adapted for the removal of serious cases, and when canals and waterways exist on the western front they have been used to convey wounded from the evacuation hospitals to the base hospitals. The wounded are carried in barges which are specially fitted for the purpose. Each barge carries 30 patients, who are lowered into it by means of a central elevator worked by hand. The barges are towed in convoys of three by a steam tug. This form of transport is utilized chiefly for patients with serious head, chest or abdominal wounds. Pontoons have been used to bring back wounded from the forward area to the advanced dressing stations. During the Arras battle pontoons were used on the river Scarpe for this purpose. They were towed by R. A. M. C. bearers.

HOSPITAL SHIPS

These are specially fitted ships for the transport of wounded overseas. The ships are painted white with a broad green band running from stem to stern. Red crosses are painted on the sides of the ship and on the funnel. At night the ship is illuminated by green lights round the hull, and the red cross is formed by red electric lamps. The marks of a hospital ship are so distinctive that it would be impossible to mistake it for anything else. Ships of all sizes and carrying capacity have been used. The smallest accommodates 200 and the largest 3,000. Returning transports are sometimes used to bring back wounded, but unless there is wide and open deck space they are unsatisfactory.

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THE ARMY VENEREAL PROBLEM

By Major G. R. CALLENDER
Medical Corps, U. S. Army

EFFICIENCY may safely be considered as the watchword of the modern era. Let us consider the factors which have been shown to lead to that much desired goal.

The great business organizations in this and other countries have progressed toward this goal in a remarkable degree. The steps in this progress show the adoption of labor-saving devices too numerous to mention, consolidation with diminution of overhead expenses and coördination of interests, etc., until, at present, little is to be desired in these directions; but still there remains much to be accomplished. Gradually people have come to the conclusion that individual personal efficiency is the next, if not the final, step in this advance.

The personal factor, as might be expected, resolves itself into three others; that of morals, of intellect, and of health on which the intellect so largely depends. It is human to err and civilization is prone to indulge to a greater or lesser degree in vice. Though that tendency is markedly inhibited by the churches and allied organizations, nevertheless, there are many who, realizing the moral right and wrong, will not or do not interpret their convictions by actions, and many more who do not consider such at all, because they fail to connect these influences with their material welfare, with which alone they are apparently concerned. There is practically none, however, to whom pain and sickness are strangers, even though he does not always realize the etiological factors. Morality is the goal to which some may attain at once, but the majority will proceed slowly along through intervening phases of advance.

The drug and alcohol addictions have long been recognized as vital influences in promoting inefficiency, and one needs but to note the strides towards temperance during the past two years to realize that abstinence is to be a prominent step in the campaign for efficiency.

Most of the various infectious diseases, because of their ability to spread and involve large numbers of people, have always been fought with all possible zeal, and the fight has been aided by many laws and restrictions, yet the most formidable of these—venereal diseases, which cause more pain, misery and deaths than all others, if the truth be told, and consequently contribute a maximum toward

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inefficiency, go on their way unrestricted and, in fact, nourished, by the almost total lack of publicity they receive and the constant absence of knowledge the public has of their ravages.

Some day, in the movement for efficiency, these facts will be brought out in their true light and to do this, in a small way, is the object of this paper.

Venereal diseases have been and are one of the greatest scourges of all armies, yet how little is heard of them outside our immediate circle, in comparison with what is heard of typhoid, yellow fever and infantile paralysis. Is it right that these diseases, undoubtedly of far greater importance to the well-being and betterment of our race, should be kept constantly in the dark and allowed to go on unrestrictedly, involving greater and greater numbers of our population with never a voice rising above a subdued whisper to say nay? Military medical officers are perfectly aware of the conditions and dangers but, as their efforts are necessarily confined to the limits of their garrison, they can accomplish little toward the eradication or diminution of these diseases in general, and no one outside the services aids in any but a limited degree.

Military service requires physical fitness as nearly as possible approaching perfection, and to accomplish this in each and every soldier is the prime duty of the medical officer. In his struggle to this end he has been confronted with many diseases, but none have so completely baffled him as venereal diseases. Yellow fever, smallpox, typhoid and many others have all succumbed to untiring effort, largely because the means of control have been placed in the hands of the military surgeon, and military law has enforced their use unhampered by interference of civil authorities, be it said, because the measures used have not interfered with the ideas of the communities within which they were used, nor even remotely affected the sacred personal liberty of the civilian. It is not so with venereal diseases. The Army and Navy have made and enforced laws governing the prophylaxis and treatment of venereal diseases among their members; but only in exceptional instances and for brief periods during military occupation of certain places, outside the continental United States, have they been able in any way to control the sources of infection.

The published reports of the morbidity from venereal diseases in armies show that of the United States to be among the highest; yet in no other army are greater efforts made to recognize venereal diseases or accurate records kept of their occurrence. Routine physical inspections result in the detection of many cases, either at the inspec-

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tion or before, by voluntary admission. The routine examination of urine and the liberal use of the Wassermann uncover a large percentage of the existing diseases, while the recent adoption of the latter test at recruit depots detects practically all the syphilitics entering the service. It is probable, however, that the incidence of these diseases the U. S. Army has been quite as great if not greater in recent years than in most, if not all of, the continental armies. As Howard says:

> The more general application of personal disinfection, following coitus, under official sanction and direction, and the more effective regulation and control of prostitution, are the factors probably responsible for the lesser incidence abroad.
>
> Venereal diseases in armies, while not entirely eradicable, are preventable in great part. The specific causes, the exact methods of transmission, and the sources of infection are known, hence the accepted principles of scientific preventive medicine should be applied for their control as far as possible.
>
> Prophylactic measures of known efficacy may be possible of application in some armies and not in others. The problem is therefore a special one for each army concerned. In the United States Army, whatever effective measures we are able to apply are those directed chiefly to the individual soldier. The sources of infection are beyond military control, and we can hope for no effective regulation and sanitary supervision of prostitution by the civil authorities in view of a public sentiment in the United States unalterably opposed to any form of official recognition. The policy of the higher military authorities in the War Department for many years was one of silence and inaction concerning the question. The issuance of military orders directing inspections of troops for venereal diseases, the use of prophylactic solutions following intercourse, or other preventive measures, were opposed, as it was held that the publication of such orders may prove offensive to the gneeral public and humiliating to the service.
>
> The subjects of sexual hygiene, the venereal diseases, and the social evil are now discussed from public platforms and in the press with a frankness that would not have been tolerated by public sentiment a decade ago. The public is thus being enlightened concerning the wide prevalence and frightful ravages of venereal diseases. It is believed that the fuller discussion and comprehension of the venereal peril has been productive of much good and may ultimately result in the application of straightforward and sane measures for the control of these diseases in civil communities. Indirectly this will benefit the Army, for the soldier does not contract venereal disease in his barracks but from the prostitute in civil communities, who at present is permitted to disseminate infection without restriction.

Another factor of prime importance in the venereal problem is alcoholic indulgence. Colonel Maus, writing in 1912, said:

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The educated world has begun to realize that the three great social cankers —alcoholic addiction, prostitution, and venereal diseases—must be met by scientific and rational measures. Why attempt longer to conceal in the closets of social life these ghastly skeletons which for centuries have been gradually but surely gnawing their way to the very heart of human existence? Venereal diseases are intimately associated with two of the most prominent sociological problems of the age, alcoholic addiction and prostitution, and assisted by the increasing immoral tendency will, if not checked, lead to a declining birth rate, degeneracy and possibly race annihilation. Alcohol plays such an important rôle in the contraction of venereal disease that it is questionable whether more than 5 per cent of the morbidity occurs among the abstaining class. The educated world is rapidly drifting to a high plane of rationalism in the discussion of these problems and beginning to discard maudlin sentiment and prudishness which, heretofore, have stood as barriers to intelligent action and common sense.

Speaking of the military control of prostitution in Jolo in the early days of the Philippine insurrection, Colonel Maus said:

At the time Jolo was under military control and the public women were examined weekly and segregated. Those found diseased were at once transferred to a lock hospital and retained until they were cured or the infectious stage had passed. The results were most gratifying among the troops, inasmuch as they were practically kept free from these loathsome diseases during the regime, which lasted several years.

In regard to the examinations he said: "The examinations should be made with great care and none countenanced unless made with the speculum and microscope."

Let us now consider the results of venereal diseases as indicated by our sick report.

In the decade ending December, 1912, there were for all venereal diseases 118,056 admissions, or 180 per thousand; 1,732 discharges, or 2.6 per thousand. The discharges were exceeded only by those for tuberculosis. In the year 1914, there were 9,655 admissions, or a ratio of 110; 67 discharges and 5 deaths. Venereal prophylaxis had been in use for five years, and the reduction from 180 to 110 is thus explained. In admissions, venereal diseases exceeded by over 70,000 their nearest competitor in the decade mentioned, and in the year 1914 exceeded by about 5,000 the next most frequent cause of admission, acute affections of the throat.

The noneffective rate for venereal diseases, the true measure of their result on military efficiency, was, for all troops in 1914, 434.6, or a ratio of 4.47—more than twice that of any other disease. This means, in plain terms, that there were in our army, averaging about 98,000 men, 434 constantly sick in hospital with venereal disease, or

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about 8 men in every 2,000. In addition many were under treatment but not in hospital.

The sick report, while indicating very clearly the importance of venereal diseases, does not begin to portray their prevalence. Many cases are admitted several times but, what is more important, many cases of syphilis pass unrecognized.

Colonel Vedder, in a comprehensive series of Wassermann surveys, determined that about 16 per cent of our white enlisted personnel were syphilitic, while the colored troops about doubled that figure. Of these only about 3 per cent were recognized and carried on the registers as syphilitics.

When we consider that gonorrhea is about four times as prevalent as syphilis and that chancroid has an admission rate about equal to that of syphilis, the size and importance of the venereal problem begin to appeal to us.

To these figures of the active diseases, we must add some of the end results, of which some are really of greater importance individually. It is generally conceded that about 13 per cent of insanity is due to acquired syphilis, which means that about 10 or 11 cases are sent to the Government Hospital for the insane each year from the service for this cause. In many other conditions, particularly affections of the heart and blood vessels, a certain proportion, and sometimes a large one, are the results or a part of the syphilitic infection. It was found that the percentage of syphilitics at Fort Bayard was more than double that of the men in the service, thus indicating clearly that syphilitics are more prone to the ravages of tuberculosis, and it was generally accepted there, during my own tour of duty at that hospital, that curing the syphilis in a person also tuberculous, markedly increased his chances of recovery from the latter disease. I may state here that tuberculosis has the highest discharge rate of any disease in our army.

Is it possible that all this infection occurs during service? Yes, possible, but the facts are otherwise. The larger proportion of the cases of gonorrhea naturally originates during the soldier's stay in the Army, although a careful study to exclude recurrence antedating enlistment has not been made, and it indeed would be practically impossible. Except at recruit stations chancroid is incurred during the service of the soldier.

At Jefferson Barracks, a recruit depot in 1911, Colonel Howard determined that about 50 per cent of venereal infections occurring at that post were contracted prior to enlistment. This percentage would probably be exceeded at the present day, with the use on every recruit of the complement fixation test for syphilis.

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Vedder in his study made surveys on recruits and determined that whereas in enlisted men 16 per cent were syphilitic, 20 per cent of recruits were affected, or, in other words, civilians of the class from which the army is recruited were afflicted with this disease to a greater degree. Comparison of these results indicates that after the recruit has joined, because of adequate treatment of the disease to a certain extent, and rather rapid separation of syphilitics from the service for other disabilities more or less dependent, the percentage of syphilis decreases to an appreciable degree.

In a similar survey on the cadets at West Point, Vedder estimates that about 5 per cent are syphilized before entrance into the service. This means that this percentage of our college population are afflicted, and probably more, as the cadets are picked men physically.

College men belong to those who form the great middle class of our country. It seems to me that a disease with a prevalence as shown by these surveys, linked with its confreres, chancroid with an equal incidence and gonorrhea with four times its incidence, or a total incidence in the latter class discussed of 30 per cent, demands more than an expression of disgust. It demands action of the most strenuous kind, and delay in dealing with this problem as one of disease, only increases its hold and the numbers hopelessly invalided through its means, to say nothing of its effect on the efficiency of our troops and industries.

Much more can now be told of the ravages of these diseases and still more will eventually be laid at their door, by the more accurate methods of diagnosis. I will mention in closing only a few conditions and their relation numerically to venereal diseases.

Miscarriages (fourth to seventh lunar month), if the child is born dead, 35 to 40 per cent is due to syphilis. Premature births at about 8 months are very frequently due to syphilis, about two-thirds of all syphilitic children being born at this time.

Only about 28 per cent of children born syphilitic survive the first year. The child of a syphilitic mother is almost always syphilitic.

A very large proportion of cases of arteriosclerosis in men under forty are due primarily to syphilis, while locomotor ataxia and paresis are now recognized as the terminations of many cases of syphilis.

Gonorrhea causes a very large proportion of chronic invalidism, particularly in women, and 50 to 75 per cent of abdominal operations in women are for conditions, the result of this disease. Most of those women are innocently infected by their husbands, who acquired their infection otherwise than innocently, and represent themselves to their better halves as paragons of virtue of which, alas, there are but few.

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COMMENTS ON THE ARMY VENEREAL PROBLEM

By Colonel R. G. EBERT
Medical Corps, U. S. Army; Department Surgeon, etc.

THE data taken from sick and wounded reports of the Hawaiian Department, for the period January 1, 1915, to June 30, 1916, show that the total number of admissions for venereal diseases is 1,602, with a loss of 21,448 days as against a total admission for all other causes of 6,241 and 63,057 days lost. In other words, more than 20 per cent of all admissions and nearly 25 per cent of all time lost to the Government from disease and injury in Hawaii are due to venereal diseases. These totals are based on an average strength of 8,833. Comparing these rates with the army elsewhere it is found, for the three years 1913, 1914 and 1915, immediately preceding the above period, that Hawaii has practically the same figures as the mainland—97.32 per thousand for Hawaii, 97.13 for the United States proper, while the Army as a whole gives 114.83.

Of the new cases reported from January 1, 1915, to June 30, 1916, 147 syphilis, 139 chancroids, and 620 gonorrhea, total 906, all were contracted in these islands. Many of these appear in subsequent admissions among the total of 1,602, and so the last figures do not represent an actual number of individuals.

Syphilitic registers show at present 360 cases of this disease among enlisted men. Of these 123 were contracted prior to enlistment, 82 since enlistment and prior to joining in Hawaii, and 155 contracted here. The difference between 155 and 147, reported as contracted here, is due to men having departed from these islands and to new cases developing since July 1, 1916.

Of the registers now in force, 102 show a present status of double plus Wassermann reaction, and 45 a single plus; these may be called active cases. Sixty-seven show a plus-minus and 146 a minus reaction, and while the plus-minuses are not actually in abeyance, they show such improvement that they may enter a different classification from the active.

Surgeons have reported that practically all active cases are, in their opinion, discovered by the inspections; of the latent cases, possibly 80 to 85 per cent have escaped detection.

There is no such check on chancroidal or gonorrheal cases prior to entry into service as on syphilitic, and to approximate the total of all venereal diseases it is fair to assume that the ratio of incidence 16 plus,

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15 plus, 68 plus, in the 906 cases which were contracted in Hawaii, will apply elsewhere. That this is not far wrong the Surgeon General's reports show, since the admissions for ten years (1901–1910) for syphilis, chancroids and gonorrhea, with their complications, were in the proportion of 15, 19 and 65 respectively. Applying the ratio, 1 syphilitic to 1 chancroidal and 4 gonorrheal, and having positive syphilitic records of 360 cases in the entire command, we have reason to assume that at least 2,160 individuals have had venereal diseases at some time. As probably only one-fifth of the latent cases of syphilis have been detected and made a matter of record, and considering only the 146 absolutely minus Wassermann cases as latent, we have reason to add to the 360 cases of syphilis recorded 584 additional, which at the former ratio (1 to 5 of incidence) would add 2,920 more venereal cases, or a total of approximately 5,000. These numbers are more than conservative. By Vedder's statement "that approximately 17 per cent of recruits are already syphilitic at the time they enter the service," allowing some margin—say 10 per cent—for congenital cases and those innocently acquired and applying the ratio of incidence, 5 cases of gonorrhea and chancroid to one of syphilis, we find that among each 100 civilians of the class from which recruits are obtained and of the average first enlistment age, 15 have contracted syphilis and 75 the other diseases. Making a further allowance of 10 per cent or even 20 per cent for multiple infection, we still have 72 to 81 out of 100 who have had venereal diseases prior to enlistment. These are startling figures.[1] In no way can they be attributed to army life, as they exist at the time of enlistment, and, as recruits are obtained from every section of the country, they may be said to represent nation-wide conditions among the class of young men that make up our enlisted forces.

In earlier days, long before venereal prophylaxis was inaugurated, when taking sick call and doing duty as ward surgeon, it was my custom to ask the source of infection, whether for "love" or "money," and the amount of damage done by non-professionals was far from inconsiderable. Advice given then to the men to form a protective association, and warn against the particular women who were spreading disease, had often a contrary result.

The policy of the ostrich—hiding the head and exposing the body—

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[1] In the September, 1916, number of *American Journal of Public Health*, page 953, at the head of an article "The Efficiency of Venereal Clinics," by Philip S. Platt, Superintendent Bureau of Public Health and Hygiene, New York Association for Improving the Condition of the Poor, the following appears: "One million, two hundred and fifty thousand individuals were treated in one hundred and twenty-two clinics in New York City in 1913 for venereal diseases . . . ." As New York's population in 1910 was 4,766,883, say 5,500,000 in 1913, it will be seen that about 22½ per cent of all men, women and children were treated in clinics. Allowing for duplications (one individual going to more than one clinic) the numbers would be reduced, but to this must be added the number of patients who are treated by private physicians, drug store prescriptions, and self-treatment.

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immorality rampant, but not to be whispered above the breath, was in full vogue and such instruction as was given was delivered to the individual in private.

Average yearly admission rates for all classes of venereal diseases in the Army from 1872 to 1911, by half-decade periods, are as follows:

1872 to 1876	105.6
1877 to 1881	97.2
1882 to 1886	76.4
1887 to 1891	77.2
1892 to 1896	76.4
1897 to 1901	121.8
1902 to 1906	149.2
1907 to 1911	147.6

From the foregoing figures it will be observed there was an apparent vast increase with the Spanish-American War. This was partly due to the influx of recruits and the generally new conditions surrounding the Army, and partly to the fact that, prior to 1900, practically all admissions to sick report for venereal diseases were based on men actually incapacitated. No physical inspections were then made, and many cases were concealed and self-treated; others were prescribed for but not recorded, except when disability became so great as to preclude duty by the patient. Moreover, many venereal complications were not recognized as such and were carried under other headings, owing to our knowledge being imperfect. This is well illustrated by the carrying over, from old Manuals of the Medical Department to the present, of the provisions of paragraph 456 (*m*) "Distinction should be made between the venereal ulcer known as chancroid and the hard chancre of primary syphilis."

From these figures it is evident there is no subject in preventive medicine of greater importance to the Army than that of venereal diseases, and that if civil authority should take this matter properly in hand with the man prior to enlistment, our duties would be much lightened; for it is more than probable that 72 to 81 per cent of our soldiers suffered from venereal diseases before joining. The tale that army life tends to debauch youth is false. Taking the average age of enlistment as at twenty-two, in the five or six years immediately preceding this age, 72 to 81 per cent of the men had had venereal disease, or at a rate of 12 to 16 per year. Our figures in Hawaii show that out of 8,833, in a year and a half, there were contracted 906 new cases, or to the extent of 6.83 per cent per year, one-half of the rate contracted prior to entry. Let us take this one step further; if 72 to 81 per cent have had venereal disease of some kind prior to the average age of twenty-two, what percentage have had sexual intercourse? Certainly more than the 72 or 81, for not everyone who transgressed became diseased.

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Prudery in the past has prevented free discussion of the sex problem; one may talk of tuberculosis or smallpox or leprosy in the parlor or public assembly, but gonococcus infection and lues are subjects tabooed. Certain classes throw up their hands in horror at the idea of venereal prophylaxis, denouncing it as an inducement to illicit intercourse and legitimizing prostitution by rendering it safe, instead of, as we contend, giving a protection to the individual and to the race. For years, because of this clamor, the military authorities hesitated to openly instruct and practice that which would save numerous days of sickness, with attendant expense to the Government, and to many individuals, suffering, permanent disability, insanity, and life, leaving wholly out of the question service efficiency. That the sanitarians' claim is correct, the following data of venereal incidence, taken from official reports of Hawaiian posts, are presented:

Year	*Admissions per M.*	*Non-effective rate*	*Total strength*
1905	153.39	13.01	176
1906	224.14	18.02	248
1907	223.96	12.84	192
1908	239.22	12.59	281
1909	225.84	23.23	1,087
1910	159.02	21.89	1,225
1911	175.27	15.78	2,014
1912	122.93	8.69	3,376
1913	91.68	5.04	6,130
1914	65.07	3.41	8,293
1915	119.55	4.43	8,958
1916	60.00*	4.44	8,594

The year 1909 marked the beginning of the prophylaxis agitation and its results are not seen until the following period. In August, 1912, the present orders as to punishment for failure to use prophlaxis were published, and the results in subsequent years are shown far more markedly in the rate of constant non-effectives (which is more nearly the true criterion) than in admissions. The year 1915 was one in which 3,500 to 4,000 recruits joined, and much of the increase in admissions may have been due to the recording of old cases of venereals, but new to *our* hospitals, and to the lack of obedience to orders by young soldiers. Data for 1916 are for the half-year; the rate is as high as 1915 and appears due to laxity in carrying out orders by the commands, and to greater activity on the part of the medical department in the treatment of syphilitics, all of which cases are made of record. If Hawaii data need corroboration, the figures for the army at large are available, with which I will not now take up space.

No one desires more than the army sanitarian that all illicit sexual intercourse be absolutely suppressed, as in that way only can venereal

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diseases be overcome; but never in the history of the world has this been accomplished. The Power that framed the human animal gave, to some of them at least, characteristics that preclude that desired result; and where shall we throw the blame? All men cannot be made moral by law; some may be repressed by fear of law, but these will not hesitate to disregard the edict, if a safe opportunity offers. The first duty is to instruct the individual in the full knowledge of the sexual relationship; tone up his moral fiber and teach him to appreciate that the various codes of ethics—religious, moral and legal—are the results of the best experience of the races that promulgated them. If reasoning does not appeal and fear too fails, as it does in so many instances, is then the medical officer wrong when he endeavors to protect the Government, the man, and the community, present and future, by lessening the chances of incidence and rendering as innocuous as possible the diseases liable to be incurred?

There are two ways of accomplishing this protection; one is the segregation of all who are infectious (and I do not mean the female alone); the other is the use of such prophylaxis as experience has shown to be valuable. We have orders for the semi-monthly inspection of the soldier, for the immediate use of prophylaxis after exposure and for segregation when diseased. Over the female we have no restraint. Where control of the women has been had—as in the British-Indian army prior to the nineties—although venereal diseases were not eradicated (for men would forage out of bounds), the results were good as compared to what happened after the system was abandoned at the behest of well-intentioned but impractical public opinion in England. Syphilis, which was present to a limited extent under the cantonment system, became so rampant that over 80 per cent of all white troops in India were luetic, and cases so graphically pictured by Kipling were far from rare. The medical journals of the time fully discussed the subject, and dwelt with alarm upon the probable effects upon the British nation when these men returned to the mother country and became possible heads of families.

Under present orders, the soldier discovered with venereal disease in an infectious stage is held in hospital or otherwise isolated. His disease is made a matter of official record, for the protection of the Government and of his comrades. Could the same be done with the civilian, venereal diseases would be reduced to a minimum. While frequent inspection of prostitutes is no assurance of safety, since a woman pronounced free one day may easily become the active disseminator of disease the next, yet an examination will eliminate her quite a period earlier than otherwise, and that period means at least

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five or six contacts saved daily from possible infection. It is not the gain of an entire loaf by a good deal, but still some bread; why, then, reject any help is so important a sanitary matter?

We no more legalize prostitution by rendering it less dangerous than we legalize the pollution of a stream by instituting a filtration plant for its waters. Let us treat both in the same common-sense manner. No sanitary engineer would scatter polluted water broadcast over a community and then attempt its purification. He would bring it into one plant and purify it under constant and direct supervision.

Why not apply the principle of isolation that Hawaii has adopted with its lepers, a disease far less easily communicated and of no worse consequences; and then, like the lepers, when the afflicted are cured and no longer a menace to the community, restore them to society. Leprosy has not been eradicated by this process, but does anyone doubt that it has lessened its prevalence? Why not apply the same principle to diseases a hundred-fold more prevalent than leprosy? Why make diphtheria, smallpox, measles, scarlet fever and leprosy, from which Honolulu had in the past three years (1913–1915) 51 deaths, notifiable and quarantinable diseases, and remain silent regarding venereal diseases, when from syphilis and its results alone 62 deaths are reported under the heads of syphilis acquired, syphilis congenital, locomotor ataxia and paralysis of insane? Of how important a factor it must have been in the cases of death of 272 still births, 83 apoplexies, 41 arterioscleroses, 19 hemiplegias and 28 paralyses, every physician can form his own opinion. What, think you, would be the result if the law required that every case of venereal infectious disease was made a matter of official record, as it is in the Army? And is there a single reason, other than that of the exposure of human frailty, for not doing so? Truly since venereal diseases are so great a curse (the greatest of curses—the visiting of the sins of the fathers and mothers on the innocent children), can intelligent people consider that reason sound or anything but a cloak for immorality?

To those who would eradicate the social evil, let me suggest the method of publication and quarantine. All others, license, regulation, segregation, dispersion, suppression, silence, prosecution and persecution, even the marking of the woman as in the romantic story of Hawthorne's "Scarlet Letter," have been tried and failed.

Publication of those who are infectious will not entirely do away with illicit intercourse, but when such are posted we are in the right way of lessening at least the physical evils. The other features of this world old problem, we, as sanitarians and medical officers, must leave to the professional moralists.

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MEDICO-MILITARY NOTES

By Major R. W. HINDS

Medical Corps, N. A. (formerly with the American Red Cross)

I HAD the good fortune to serve under the American Red Cross as director, for one year as follows: Director of Unit D in England at the Haslar Royal Hospital, Gosport; later at Paignton, Devonshire, at the American Women's War Hospital; director of a unit for Belgium at La Panne with the Ambulance DePage. The following is the substance of a report made upon my return home.

Many topics are merely touched upon, and few are treated fully for the reason that I was not in a position to pursue each topic to a conclusion. In Belgium, which is known to be a nest of spies, everyone is under suspicion and questions are not encouraged. My work was in hospitals, and it was not easy to obtain permission to travel and look into things much as I would have liked to do so. The distribution of all the sick and wounded of the British Navy is arranged from the Director General's office. Here a list of hospitals, with the capacity of each, is posted daily so as to show the number of patients under treatment and the number of vacant beds. An incoming hospital ship sends a wireless giving the number of wounded and the point of debarkation. The Director General in return assigns the cases to available hospitals, and arranges so that hospital trains may be in readiness upon the arrival of the ship, the railways clear from the port to the indicated hospital, and the hospitals prepared for the reception of the wounded.

It is not desirable to assign patients in lots of less than one hundred to a hospital. To facilitate transportation, a hospital train on one route should be able to unload without breaking up on branch lines. Therefore a hospital on a spur track would be undesirable, unless it could accommodate nearly two hundred. Such a hospital, after the discharge of 30 per cent of convalescents, could accommodate a second trainload. Larger hospitals tend, of course, to a steadier flow of patient's small ones to periods of comparative idleness, alternating with overwork.

Haslar Royal Naval Hospital at Gosport, capacity of about 1,700 beds, is an example of a permanent base hospital, fully equipped and used to a considerable extent as a training school for volunteer surgeons, sick bay stewards, orderlies and St. John's Ambulance Co. (the latter

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being trained to act as orderlies). Here the work was very well done and the discipline most excellent. It was divided into medical, surgical, infectious and genito-urinary services, a staff surgeon in charge of each with subordinate surgeons. There were two salaried consultants from civil life, both eminent men. Everything ran smoothly because the responsible positions were held by regular naval men. There were few specialists as the naval surgeons pride themselves on being able to do the ordinary operations of nose, throat, eye, etc.

Temporary base hospitals, for the duration of war only, were established by the British Red Cross or similiar organizations. Many of the smaller were paid for by private individuals. As the war progressed most of the latter accepted help from the government at a fixed rate per patient per day. The smaller institutions were painlessly put to death. They were nearly all started at a time when it seemed that the war was to be of short duration. Throughout France and Belgium the privately maintained hospitals seemed to have excellent equipment, often better than the regular organizations.

In temporary hospitals an astonishing number of civilian helpers offer their services, and some of them do surprisingly good work for long periods. For example, a New York broker worked for a year, receiving his room and board part of the time only. He developed into a very capable X-ray man with no previous experience.

A separate hospital of more than three hundred beds should have some sort of a separate building for infectious cases. Smaller institutions can get along by transferring patients of this kind as they occur.

In England, small convalescent hospitals taking cases that required only an occasion medical visit were allowed to continue. Private homes took many. This type of hospital relieved the bases of a lot of occupied beds. For base hospitals, large buildings were utilized or portable houses put up (portable in comparative sense only, frame with corrugated iron roof or in sections, walls, ends, etc.). In the utilization of dwellings built for other purposes certain changes have to be made, notably arrangements for lavatories and ward kitchens, both requiring a lot of piping. This problem was solved in brilliant fashion at Paignton by constructing small wings the full height of the building, and changing windows between, on each floor, into doors. This saved much trouble with the piping, which ran from top to bottom, entirely within the additions. Verandas may be closed in and used as ward kitchens, thus saving the danger from fires, and keeping the odors of cooking out of the wards. The other changes were minor, such as cutting doors, waterproofing floor of operating room, etc.

There was a growing tendency to organize hospitals for specialties

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such as eye, nerve, medical cases. The genito-urinary cases generally go to the regularly established military hospital. The administration of this type is difficult, as the whole staff is new and the duties ill defined. An active or retired army medical officer is indispensable for the management of the military records of enlisted men. His work is not medical, but the control of the individual and his equipment, care of correspondence with headquarters, publishing orders received, returns, etc. (another argument for fewer and larger institutions, as such men are scarce). In such cases he has nothing to do with the treatment or medical records of cases except at time of discharge.

RECORDS OF CASE HISTORIES

Case histories were filed numerically and an index was arranged alphabetically. Cross indexes were arranged according to the following classification.

I. *Type of Injury.*—(*A*) Wounds—(1) Perforating: (*a*) shrapnel, (*b*) shell, (*c*) gunshot. (2) Non-perforating: (*a*) shrapnel, (*b*) gunshot, (*c*) shell, (*d*) grenade. (3) Incised. (*B*) Miscellaneous Injuries—burn, crush, dislocation, etc.

II. *Complications.*—(*A*) Infections—(*a*) neuritis, (*b*) retained foreign bodies, (*c*) fractures (anatomical arrangement).

III. *Location of Injuries* (with the exception of fractures).

IV. *Non-traumatic Surgical Conditions.*

V. *Operations.*—(*A*) Before admission. (*B*) After admission.

VI. *Medical Conditions.*—(*A*) Infectious: dysentery, typhoid, etc. (*B*) Non-infectious. (*C*) Eye. (*D*) Skin. (*E*) G. U. system. (*F*) Miscellaneous.

VII. *Results of Treatment.*—(*A*) Cured, improved, unimproved, dead.

VIII. *Time Elapsed from Injury to First Aid.*

IX. *Time from Duty.*—(*A*) In this hospital. (*B*) In other hospitals.

X. *Disposition.*—(*A*) Duty. (*B*) Invalided out of service. (*C*) Transferred.

To complete the record the number of each case was entered upon an appropriate card of each classification. If it were desired to look up retained foreign bodies of the chest, III gives all the chest cases and a reference to I (*A*) 2 would show just what cases are desired.

The system seems cumbersome, but if my memory serves me correctly, five of us were able to classify two hundred cases in less than three hours.

Iron beds should be high and strongly made. Cheap beds break at the joint between the side pieces and the ends. By each bed should

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be a locker, cradle, bed tray (legs about 5 inches long); back rests and dressing cars in each ward, as well as opaque curtains for all apertures, if in the zone of aeroplane attack.

At Haslar, the diets were: milk, low and full. All but the last could be supplemented. The exception made saved 90 per cent of the complications in the kitchen, since that proportion took the full diet. The full diet was made particulary generous with this object in view, *i. e.*, to save a lot of extra individual orders. I have a diet sheet of this hospital showing weights of foods. At Paignton and La Panne the food cost per patient was very low, due to the patriotic contributions of staples. In the former place the fishermen of Brixham contributed the pick of their catch every Thursday and never failed to provide enough.

Fracture appliances are usually stored at points available to the wards. Plaster of Paris bandages are best freshly made from ordinary bandage and the best plaster obtainable.

Dr. De Page has a very efficient way of using plaster of Paris for compound fractures. A single or double compound femur is put up in a double spica, with three braces connecting the legs. For these braces he uses coarse metal gauze like that found in a hospital corps pouch, cut 20 by 2½ inches. At the site of the dressings he bends the strips and places two on each side, one anterior and one external, winding them heavily with plaster bandage. When hardened, these serve as handles in moving the patient, give rigidity, and no plaster is near enough to the wound to become foul. Compound fractures of both bones of the forearm or humerus are treated in the same way. Once the plaster is set the patients will stand a lot of shaking without complaint. A particular advantage lay in the fact that they could be moved in case of bombardment.

At La Panne a small autoclave did the work for the operating room and wards, at a time when the hospital had about 300 beds. It had to run day and night to do it. Everything was sterilized in drums. Later a larger autoclave was provided.

X-ray and fluoroscope are indispensable, but not infallible in old, partially healed wounds. A powerful X-ray apparatus on wheels was very useful in the wards. The telephone probe is a cheap and interesting toy, but is rarely of use. The electro-vibreur is said to be very useful. It is easily made, costing but $50 for the materials. Its action depends upon an alternating current, and works with iron, steel and nickel fragments. There is said to be enough iron in German aluminum fuses so that the particles may be located with it. I should say that its use would be principally in partially healed wounds at base

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hospitals, since fresh wounds permit careful exploration during the cleansing process.

As to the magnet so useful in eye work, I understand it is of little value except where the bit of metal is in a fluid or semifluid media, otherwise the metal cannot approach the magnet, and if the magnet can be brought into actual contact with the metal we can do the same with the finger and the apparatus is unnecessary.

If patients arrive by trainload lots, two or three hours' notice is necessary. Ambulances and bearers must be at the station. At the hospital some sort of ticket system must exist to aid in the distribution of patients to the vacant beds in the various wards. The stretcher cases always require the most care and should be evenly distributed to the wards on the lower floors, the latter as a fire precaution and to save litter work on stairways. Two blankets should be provided for each litter. At La Panne fully clothed men, with overcoats and one blanket, came in blue and shivering from the cold. At Paignton the stretchers went to the wards with the patients. It was always difficult to get them back to the station for the second or third time. It was out of the question to hold each ambulance till its litters came back from the wards, for this would have caused endless delay at the station.

In the wards dust sheets cover the beds to be occupied. Large bags, each with a tag, are provided for clothing, which must be sterilized. A careful search of pockets should be made for cartridges. The patient should be bathed, fed and put to bed. Only the more urgent cases have their wounds dressed at this time.

At the risk of some confusion I have not described the Ambulance DePage at La Panne with any sequence, for the following reason. It was a base hospital in the sense that the patients were sent to the rear so nearly cured that they required little more than a daily dressing, and almost no surgery. When, however, an engagement was expected, the hospital was emptied as well as possible, without risk to life and it became something resembling an evacuation hospital. During a battle, from its nearness to the front, it was in effect a field hospital, when the proposition was very different. The cases arrived at night in great numbers, often with no warning.

It may contribute to a better understanding of the Ambulance De Page to say that the enemy could easily bombard it with 6-inch guns—as they did Furnes, three miles farther south. Dunkirk and Calais had many damaging air raids, the latter by Zeppelins, while we, in three months, experienced but two air raids. Our buildings were a converted hotel (inflammable), four lightly constructed, but permanent, wooden wards with corrugated iron roofs and a number of brick villas for the

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staff. The hospital was on the beach in a long row of villas, the town extending inland. The rest of the village in our row and the town were occupied by troops, in numbers varying from 2,000 to 8,000. You may be sure that red crosses were painted on the roofs of all of our large buildings. We remained only on account of the forbearance of the enemy.

At La Panne some sort of operation was the rule, and as it was undesirable to bring a dirty patient directly into the operating room, a system was devised by which the cases came to a pavilion containing a ward of 40 beds, baths, X-rays, a small operating room, rooms for doctors, nurses and orderlies. When a patient entered at night he was stripped, bathed, given anti-tetanic serum, X-rayed and taken to the small operating room. Here the wound was shaved and explored. If extensive or dirty, a complete operation was performed. If slight and very clean, the skin edges were pared without an anesthetic. Cases involving the brain, abdomen or chest were taken to a fully equipped night operating room instead of the small operating room. The following morning, cases from the admitting pavilion were transferred to the various wards. Cases admitted during the day, after the same preliminary measures, were sent at once to the various operating rooms in connection with the ward, since the whole staff were available. At night the doctors took their turn in the admitting pavilion—one up, and three on call nearby. It was one student's duty to see that all received the anti-tetanic serum. I scarcely saw any tetanus, although there was some at first. The man on duty at night also covered the emergency calls from the wards—often hemorrhage.

For about 800 beds there were four operating rooms with a total of nine tables, more could be improvised if there were many admissions. These were fairly busy even in slack periods, as the more serious daily dressings were performed there, this for two reasons: (1) It facilitated the ward work which was very heavy, and (2) it enabled the chief surgeons to keep track of the more grave cases. After a big engagement the whole staff worked continuously.

For the amusement of the soldier patients, vaudeville entertainments are encouraged, and in some places convalescents can be taken out motoring. Occasionally a convalescent patient would manage to get intoxicated, but the European soldier requires little discipline and behaves himself to an incredible extent, though I have heard several say, with great emphasis, that as soon as they got on furlough they were going to get deaf-dumb-paralytic drunk. For minor infringements of discipline, the usual one or two weeks' furlough would be curtailed. For a serious breach, the patient would be sent to a regular army hospital or court-martialed.

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Both the British and Belgian soldiers have a tendency to take whatever is coming without complaint. They are thoroughly broken and make ideal patients. I tried to get the British regulars to complain of the food at the front, but they would not. These men coming from France after having been for days under a heavy shell fire were in an interesting nervous state. For the first few nights the wards would be constantly disturbed by men crying out. It took nearly a week for the men to realize that they were not under fire, and to get them so that they were not having nightmares.

I recollect but two men who wanted to go back for more. The rest did not complain and felt that continued service was inevitable. A man who has been through hell once and escaped with his life does not want any more of it. Of the two who wanted more, one was abnormal in many ways; the other operated a machine gun and enjoyed it. Quite a number went back from motives of revenge. With less disciplined men desertion would be much more common.

Most of the hospitals near the front had to improvise at one time or another. For example, cotton batting—that noncapillary, non-absorbent curse—gave out. Pieces of Turkish toweling were used instead and washed to be used again. It was absorbent, less bulky, and the staff liked it. A tremendous amount of some such material is needed. Economy of supplies such as is shown by all our larger hospitals, necessarily cannot be practiced at the front.

A Belgian regiment is said to have 250 men to a company, four companies to a battalion and four battalions to a regiment. Each company in the trenches has assigned it a sanitary corps man and two stretcher-bearers. Nothing remains sterile in the trenches, so they have almost no equipment. For the transportation of stretcher cases, wheel carts are very useful. In a number of instances two patients have been carried for short distances on one litter, lying opposite ways. The cases were taken to the second line of trenches at night, and from that point by zigzag communicating trenches to the battalion dressing station, in a dugout as nearly bomb-proof as possible. Here there were two doctors and four to six helpers. At this point hemorrhage is arrested, and iodine and sterile dressings applied. This station is near a road and must have a telephone. In this zone hospital corps men (Brancardiers) bury the dead and keep a record of them. In the trenches they do what they can with the enemy dead—bury them, or, if they cannot be reached, squirt gasoline on them and set fire to it, or use lime, etc. A strong odor from the dead bodies between the opposing trenches, borne by very light breeze, is taken to indicate an impending gas attack, since such air conditions are essential for an effective use of gas.

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The distance that stretchers must be carried or wheeled is said to be 2,100 meters on an average. Each division dressing station collects cases from battalion dressing stations by ambulance, a distance by road of not more than 5½ miles. The actual distance of the division dressing station from the German trenches is estimated at 3½ miles. At the division dressing station slight cases are cared for; the more severe cases have their dressing renewed and are distributed at once to the larger hospitals. One division dressing station was in an old school building and accommodated 60 to 80 patients, mostly on straw ticks. One of its functions was to provide dispensary treatment for troops in the vicinity (reserves), and the separation of the sick into classes as follows: those who would be fit for duty in two to five days were kept at the division dressing station; their clothing was fumigated with sulphur to destroy vermin and baths were provided for the men by means of a portable water heater, fitted with a pipe which had eight spraying nozzles. In this manner eight men could bathe at a time, in little booths four on each side. Patients requiring two to three weeks' treatment were sent to another hospital that I will describe.

This hospital, in the same zone, received mostly medical cases, dysentery, bronchitis, etc; although hernia and hemorrhoid cases were operated upon and sent to their organizations after their recovery, never getting out of the fighting zone. Here they had another plant for bathing men, and killing vermin on clothes. One building contained headquarters and record room, a sitting room for officers and a dining room, another building had kitchen, men's quarters and, on the end nearest the road, a very small G. U. room. The last was for the treatment of outpatients who could come and go without being seen at night, if desired. They gave salvarsan and kept the patient overnight on a mattress. Other buildings about the same size were as follows: an operating and X-ray building, several wards accommodating about 30, with two rooms on each end; the first two rooms were for a doctor and a chief steward (the doctor was constantly responsible for the discipline and care of his ward), and the last two rooms for isolation. All these were new frame buildings, white enameled inside, and of the semi-portable type, with central ridge ventilation. There were stoves for heating, latrines like ours, and the buildings were scrupulously clean. A bomb-proof was nearby, guards were posted about the hospital.

A motor ambulance station, with about 50 cars, was located near the division dressing station and connected with it by telephone. The cars were used in carrying the wounded from the division dressing station to the rear.

Malingerers were eliminated at the division dressing station. They

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sandpaper their shins, smoke cigarettes containing a pinch of salt with the tobacco—said to produce a frightful facies—and rupture the ear-drum by filling the external auditory meatus with water, and getting a friend to give them a box on the ear (in a lateral position, of course). This invariably produces a complete rupture of the drum. The rupture passing through the tip of the malleolus.

Many claim disabilities of hand or foot. To aid in their detection a small portable X-ray outfit is used. This consisted of a small one-cylinder gasoline engine, water-cooled by means of a circulation from a barrel on a chair to another on the floor, a small dynamo, a coil and a tube. The plates were as small as possible, 4 or 5 inches square, used for the metacarpal bones of an alleged injured hand. The table for X-ray work was a mere frame with removable wooden slats, home made. All of this could be easily loaded on one wagon. Eye and ear dark rooms were made by pinning up blankets in corners. The commanding officer said that he could move the whole plant in twenty minutes. Twenty or 30 horse-drawn ambulances were detailed to bring cases from the battalion dressing stations.

The country is open and very flat, nevertheless, horse-drawn ambulances are indispensable where there are no roads. In addition to the ambulances there was a little closed carriage for the priest, an X-ray wagon, a cook wagon, and several low wagons peculiar, as far as I know, to the Belgians. Each of the latter carried medical chests below and on stretchers above, ten stretchers on each side. This allowed room for the front wheels to undercut. These wagons were placed at 20-foot intervals on the periphery of a field where there were a few trees, to make their discovery and destruction by aircraft difficult.

English R. R. hospital trains have two marked advantages over ours, one in being able to unload at platforms that are flush with car floors, and the other in having side entrances to the cars. An interesting device to aid in unloading was a canvas strip (about 2 feet by 4 inches) with rings at the end. One of the canvas strips was laid transversely across the center of each bed in such a position that it would come directly under the patient's buttocks before the patient was put in. Over each bed on the ceiling of the car were two heavy screw eyes, one over the center of the bed, the other over the aisle. When it was desired to move the patient from the bed, a stretcher was brought to the bed side, two small blocks and tackle were hooked into each end of the strip, to the corresponding rings in the ceiling, and by pulling on these the patient was brought out over the stretcher.

The cross channel hospital ships, I understand, furnish nourishment and reinforce dressings. Their run cannot take more than six hours and probably nearer three.

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At La Panne ambulances are used to a limited extent for hospital purposes—passengers, baggage, and for some special supplies—to and from Calais, 40 miles distant. They are of different makes, many of them from Antwerp, converted heavy touring cars. The bodies are as various as the cars, but all are well made. The man in charge of them, a highly educated Belgian, must have had 24 large cars. Cases were taken to the rear in trains of 6 or 8 cars, and brought from the front by other ambulance companies in the zone of fire, as well as by ours. The director of ambulances believes in a car of at least 14 to 16 horsepower (French) and says the best arrangement is for six litters.

The problem of the disposal of the soldiers equipment is most important. It is solved by taking five cases only, and using the sixth litter for the equipment. One kind of body has a trolley arrangement made by having the suports for the stretcher handles suspended from wheels which run on longitudinal tracks. It is well liked and greatly facilitates loading and unloading. All bodies with central posts hinder this work. An excellent arrangement was one that used permanent, longitudinal seats to support two out of the three lower stretchers, the third being on the floor while the upper three were held by a support which, when not in use, folded against the side walls of the body. Another very good type had hinged central posts which folded out of the way when used for other than stretcher cases.

An interesting French variety was built with three tiers of two stretchers each with an elaborate arrangement of springs. It was cold, there was no place for equipment, and a lot of time was consumed in fastening curtains and stretcher handles. It would seem that the two top cases must get a lot of motion. Two of my men who rode recumbent on the lower tiers commended the arrangement of the springs. A device which I saw on a horse ambulance was a longitudinal seat on each side, hinged so that it could be turned over toward the center to support a litter. A long, narrow tool box on the floor between the central posts seemed to utilize space which otherwise would have been wasted. All wooden wheels in Belgium have straw ropes woven around the axle near the hub. In dry weather the straw is kept wet and prevents loosening of the spokes. A good ambulance must have a tight back curtain or it will become very dirty and filled with gas fumes. Ventilation must be provided for at the front or sides, and the exhaust must not be at the rear. Heating arrangements are desirable; a large lantern will do the work.

In regard to the Ford car the drivers tell me that it is best used for three recumbent patients, two on the floor and one suspended in the center above. Four somewhat overload it. The car carries four sitting,

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on adjustable cross seats well forward. The body has a lot of overhang. The Fords have done excellent work, on account of their weight, and stand up well under hard, continuous usage. Repair cars accompany each unit. I understand that the steering knuckle has to be replaced occasionally. Four holes are cut in the tail board to admit the long litter handles. To keep the car from becoming too cold on that account, canvas bags were tacked over the opening.

It should be emphasized that fractured femurs and cases of that class should be on the floor of the ambulance where they get the least longitudinal and lateral motion.

At the front, drivers frequently slept in their ambulances, but now I hear that many have become so foul that it is no longer possible. Gasoline, tires, etc., are supplied at the military depots. The drivers are almost all civilians. As an example of the flexibility of the system, upon the occasion of a fire in our hospital many ambulance companies reported with their cars; others offered their services by telephone, and I am sure that 500 odd cases could have been evacuated to Dunkirk in at least six hours with cars available.

The heavier armored motor cars have trouble even on the Belgian roads. In one instance 18 motor trucks were broken one after the other, due to overloading with ammunition. The driver usually insists on covering the floor of his truck, no matter what the size of the ammunition or the capacity of the truck.

The best litter I saw was non-folding—the Belgian model M, 1898. It weighed 16 kgm. The canvas was laced up the back with heavy cord and had flaps to attach across the patient's ankles, wider ones for the hips and an adjustable back rest with a pocket for equipment, blanket, or pillow. Short, compact iron legs folded inward out of the way. Other stretchers were like ours but of lighter construction.

The most simple type of stretcher, and certainly the best for hospital use, if not for all uses, consists of two poles, a pocketed canvas, and two spreaders. The poles are best made of seven-eighths lumber about 2½ or 3 inches wide.

The spreader depends upon the angularity of the poles for its action. It is made of heavy strap iron and is riveted. The handles do not tend to rotate out of the hand on account of these spreaders. For work on stairways they are best left out. There are no legs on this type, but they could be easily supplied if desired.

When there is a rush of cases at the hospital, trestles are provided for the stretchers, making a satisfactory operating table. The trestles have strips nailed on top to engage the stretcher handles.

Each ambulance carries its own litters and gives up an empty litter

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in receiving a loaded one. Exceptions were made in the case of a few ambulances that had a special litter and could not use other kinds. Most of the ambulances were altered so they could take any type of litter. In spite of everything the tendency is for the litters to accumulate at the rear and, if there are many casualties, many litters are needed at the front, where the motor ambulances cannot go, so reserve litters are provided at the front.

The cases which we received at Paignton were not as a rule severe. They were mostly slight cases, three days out of the trenches and they showed the modern bullet to be benign. Severe cases were received late, after they were sufficiently convalescent to stand the journey. A considerable number were septic compound fractures that required the removal of bone fragments before sinuses would close. There was surprisingly little osteomyelitis, but I am sure that Europe will be full of it for years after the war. That there is not more is due to the great recuperative power of young men in good condition. To illustrate —if a skin graft were not done at once it soon became unnecessary. To a greater extent at Haslar, when the Belgians came from the evacuation of Antwerp, and to a still greater extent in Belgium, we saw a very different picture. In both places we received cases requiring full treatment for the first time, these not being sorted out or chosen for their ability to stand a journey. The cases at Haslar showed more shrapnel wounds than cases from other sources, also a lot of bullet wounds of soft parts which did not develop gas gangrene.

I recollect but few cases where bullets had drilled soft epiphyseal bone without communition. Very extensive communition is the rule. The X-ray frequently showed diverging fine fragments of lead core from the point of contact with the bone to the exit, as though a soft lead pencil had been rubbed on the muscle. Secondary projectile of bone fragments was evident.

(To be continued.)

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OPHTHALMOLOGY AS A SPECIALTY ASHORE AND AFLOAT

By Surgeon G. B. TRIBLE, U. S. N.

IN MANY respects ophthalmology in the service, whether ashore or afloat, differs widely from ophthalmology in civil life.

A large part of the work consists in examinations to determine the fitness of the individual for service, so that diagnosis and prognosis play a greater part than treatment of the existing condition. In our military service there is no dividing line—a man is fit for duty and service, or is not; no classification exists as one finds in the continental European armies, where gradated divisions are found, and the partially deficient are accepted for special service. This is properly so from our standpoint; the Army and Navy ordinarily are small—are simply a nucleus around which the various elements which go to make up the national forces in time of war may gather. With compulsory service, nonpaid, or paid a minimum, it is important that every available man be made to do his bit.

Specialism in the Navy, properly speaking, is a comparatively new development which has been rendered necessary by the growth of the service and by the progress of medicine in the outside world. Due to the severe competitive examinations and the high standards required, the military surgeon, on the average, probably possesses higher scientific training than his confrères in civil life, but it is too much to expect that he should be a specialist in all branches.

As yet it has not been feasible to have an eye specialist do only eye work. It is necessary to do ear, nose and throat as well; in fact diseases of the ear are assuming an increasingly important place, and ophthalmology as used in this article, includes its sister specialties, otology and laryngology.

Each of the naval hospitals as well as the Naval Academy, has sufficient work for a specialist. In several of the hospitals very complete equipment, adequate space, and trained assistants are to to be found. Particularly is this true at the Naval Hospital and Dispensary in Washington, where the work done by the specialist on duty is more like civil practice, at other places the proportion of women and children among the patients being very small. Afloat the only place at present equipped for special work is the hospital ship *Solace*.

Necessarily the space allowed on a ship is extremely limited,

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and possibly it would interest an ophthalmologist from civil life to see how it is utilized. However, much can be done in a small space if necessary. Of course, on such a small ship, such things as waiting rooms are unknown.

On the new hospital ship there is much more room in the eye department. The booth system will be used and in that way three cases can be carried through at one time. Under the present arrangement, minor operations, or rather those performed under a local anesthetic, are done in the eye room, while all others are taken to the general operating room. On this hospital ship there is a small operating room in connection with the examining and treatment rooms, so that practically all operations in this department can be performed without recourse to the main surgical division.

Throughout the year operative work is quite an important factor, conditions requiring simple treatment being usually retained on the respective ships, or returned to the ship as soon as practicable.

At present the functional examination of the ear is very difficult, because of the practical impossibility of securing quiet, but to a certain degree this will be obviated on the new ship, for it is the intention to put in sound-proof bulkheads around this department. Refractions under the ages of forty to forty-five years are usually performed under cycloplegia. This is imperative in the cases of midshipmen, since a certain percentage of cases, presenting spasms of the accommodation, simulating myopia, is found every year.

When with the fleet, to avoid confusion and to facilitate the work, the following system has been evolved. A medical officer on board any of the ships finds a case which, in his opinion, needs an examination of the eye, ear, nose or throat by the specialist on board the hospital ship. He then sends a signal, officially, to the medical officer in command of the hospital ship, requesting an appointment. This is referred to the special department, and the first available time is given. Naturally, in case of an emergency, examination is made at once, or the patient can be transferred directly as a hospital case.

A report of the result of the examination, and any recommendation regarding treatment or the advisability of operative procedures, are made in each case and forwarded through official channels to the medical officer requesting the examination, or in some cases the data are entered directly in the health record. Prescriptions for glasses are given directly to the patient, who must provide them himself. A copy is entered in the health record and, when practicable, the patient returns with the glasses to have them checked up.

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A case requiring operative treatment is admitted as a regular patient. In general this routine is followed elsewhere in the service.

To give an idea of the nature and extent of the work carried on, the reports of the work in this department for the winter drill season of 1915 and 1916 will be given:

February 21 to April 2, 1915

Eye treatments and examinations	299	
Refractions	47	
Ear treatments	160	
Nose treatments	143	
Throat treatments	64	
	—	713

Major Operations

Frontal sinus, Kilian modified	2	
Mastoid modified, radical	1	
	—	3

Minor Operations

Polypi	7	
Submucous resections, septum	3	
Turbinotomy	1	
Septal spurs	2	
Cauterization	2	
	—	15

February 9 to April 9, 1916

Eye treatments, and examinations	261	
Refractions	286	
Ear treatments	370	
Nose treatments	375	
Throat treatments	264	
	—	1,556

Major Operations

Mastoid modified, radical	2	
Mastoid radical, plastic	1	
	—	3

Minor Operations

Abscess of orbit, incision and drainage	1	
Adenoidectomy	2	
Polypus nasal, removal	1	
Polypus aural removal	5	
Tonsillotomy	3	
Tonsillectomy	5	
Septum submucous, resection of	15	
Paracentesis, drum	5	

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Turbinotomy	7	
Chalazion, incision and drainage	2	
Pterygium, excision of	1	
Ossiculectomy	1	
Cauterization, linear, of inferior turbinate	4	
Cyst (orbit), excision of	1	
	—	53

From this it can be seen that the eye department is extremely active during the winter drill period at Guantanamo. At other seasons there is much less to do, but even when in the navy yards, or undergoing overhaul and repair, considerable reference work is done.

The natue of the work is varied; the enlisted personnel being drawn from all walks of life and embracing men of many races, subject to many diseases, a wide field is opened to the specialist. Occasionally very unusual cases are seen, particularly in some of the out of the way places, where the field is untouched. Recently, in Cuba, the writer was fortunate enough to see, in connection with Surgeon Spear of the Navy and a native practitioner, a post-auricular fistula about 1½ inches back of the ear, and upon radical operation this was found leading directly to the sinus. The sinus was discolored, a sero-sanguineous pus and exudate were on its wall, it did not pulsate, but, after removing the necrotic tissue and bone, pulsation returned. The mastoid cells and antrum were found filled with pus and granulations. After thoroughly clearing out the cells and antrum, it was decided to leave the sinus untouched. Six weeks later, returning to Cuba, Dr. Fabier, the Cuban surgeon, sent word the case was "perfectamente bien." How this case escaped death, and why a perisinus abscess should choose to burrow through bone and discharge externally, in preference to involving the brain, is one of the incomprehensible things in surgery. Naturally, in a well-organized community, such cases are not seen.

Afloat, unusual eye cases come up from time to time and recently a dermoid of the conjunctiva came over for treatment. During several months in Mexico, many interesting cases were seen. While there seems to be but little literature on the subject, the number of glaucomatous cataracts there was astonishing. Whether the Mexican Indian is more prone to this condition than the white, or whether the cases merely were the result of neglect, it was impossible to determine.

Occasional conflicts of opinion between the military specialist and the civilian are inevitable, primarily due to the different points

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of view. Again, the civilian specialist or general practitioner is fundamentally an optimist, his duty being to cheer up and alleviate the patient; while the military surgeon must be coldly and scientifically accurate. The military surgeon is familiar with the environment and circumstances under which the men of the service must live and work, is familiar with the great strains upon endurance that soldier and sailor must meet, while in a great measure his professional brethren in civil pursuits are not. The result is that the applicant for the service, or a candidate for the Academy, who has been rejected by the examiner or examining board, sometimes goes to the civilian and is assured that his case is not serious, and that there is no reason why he should not be a good risk. This may be correct, but no such latitude is given the military surgeon. The interests of the Government must be conserved and whatever sympathy he may feel for the patient cannot influence his findings. The candidate must meet the requirements at that examination or at a later one, or be rejected. Bitter experience has shown that the man or officer accepted below the requirements will, in a great majority of cases, continue below the requirements and yield a greater proportion of disabilities, admissions, and readmissions to the sick list, and final survey and retirement, than will an equal number who are equal to or above the required standards.

On the other hand, the military surgeon, and particularly the specialist, is accused of harshness, because he frequently fails to find lesions reported by civilians, particularly in obscure cases or those having a neurotic element. If sufficient lesion is not found to justify symptoms, or malingering is suspected, it is to be reported in justice to the Government and in the interests of efficiency.

Another of the great points of difference has been the question of color blindness. The examinations made are often perfunctory and the tests applied antiquated. The question of retinal fatigue, or exhaustion, and its bearing upon color perception must be considered. One may pass an examination with Holmgren's test, under good light, and with objects subtending a large angle, while the same man on watch in a fog or mist, or after prolonged exertion, may not only be useless but dangerous. The importance of this condition to the naval service has evidently not been appreciated by the civilian specialist. The same applies to the question of lighting; impossible recommendations frequently come in regarding treatment, special lights or shades, for individual cases.

These things are possible in civil practice of a better sort, but in the Navy, which is really a sort of socialistic state, and where, in general, no one can have what is not applicable to all, such things

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are not practicable, and even outside they are often under the head of placebos. The question of eye rest, highly desirable in itself in certain indicated cases, cannot be put into effect in an institution such as the Naval Academy without serious impairment of the general efficiency. It is certainly equally important to select the best personnel as well as matériel.

At sea, under the best circumstances, the life is decidedly abnormal. In no walk of civil life are several hundred men of various ages, habits, thoughts, racial and individual characteristics, crowded together. The ventilation must be for a great part artificial; the light artificial; the food, while sufficient in quantity and of excellent quality, is not that selected by individual preference. Unavoidably certain irritations must ensue, petty annoyances assume a magnified import, in other words, these conditions are the very ones which cause the weak to give way. Men, who at home would have gone through life without any trouble, will under these surroundings develop latent weakness.

The problem of ear protection from the effects of noise and gunfire has not been worked out yet. Actual rupture of the drum is comparatively rare, but in a broader sense the impairment of hearing resulting from the constant noise incident to ship life cannot be prevented. The impossibility of avoiding draughts, overheating, exposure to winds and rain on the deck, all tend to provoke catarrhal troubles. Tonsillitis, influenza, not to mention coryzas, and in fact all the diseases incident to crowding, tend to provoke and perpetuate catarrhal and suppurative middle ear affections. External otitis of a peculiarly virulent form is frequently seen. A sort of diphtheritic membrane will form in the external auditory canal, involve the drum, ulcerate through it, and leave an extremely obstinate chronic suppurative otitis media. No definite agent can be found; it is a clinical picture that may be produced by several bacterial organisms or moulds and is probably favored by prolonged maceration, such as comes from swimming for a long time and not drying the ears, or swelling and pressure of impacted cerumen. High diving, by direct violence, is responsible for a number of cases of ear disease, particularly if there had been a serious weakness of the drum adhesive process or dry perforations. The incidence of syphilis, with its eye, ear, nose and throat manifestations and sequellae, is responsible for quite a bit of work.

It might be well to mention here that the writer's experience in the navy is that direct involvement of the auditory or optic nerve following salvarsan has been extremely rare. Practically nothing has been seen that could not have been caused by syphilis alone.

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A little wider field is embraced in specialism in the service, whether ashore or afloat, than is usually considered belonging directly to ophthalmology in civil life.

The great question of artificial illumination of various types, good, bad, or indifferent, comes to the front. In a general way this confronts the naval surgeon, whether specialist or not, but more particularly the ophthalmologist.

Great advances have been made and are being made yearly in illuminating engineering. The peculiar conditions on shipboard render it impracticable for the most part to take advantage of all these improvements. The question of eye protection for those working at welding or with searchlights and, to a lesser degree, those compelled to do close work under artificial light, is an important one confronting the specialist at sea.

The problem of preserving the vision of midshipmen, and the study of the causes of deterioration in visual acuity and the production of myopia, have not been satisfactorily solved. Comparative study is hard to make. Other institutions of learning, such as the great universities, for the most part have but little control over the student body, and in but few cases are accurate records kept of the vision upon entrance, the effects of study or of the influence of the various types of illumination. In a manner the government institutions are expected to take the lead, so that the service ophthalmologist is not able to draw upon their records and experience for assistance.

The winter practice in Cuba and the possession of tropical naval bases have brought up the question of glare and the effects of the bright tropical sun, especially marked when reflected from the sand or water. Several types of tinted lenses have been tried, with varying success.

The increasing importance of aviation has opened a new field, and it has not been definitely determined just how acute vision and how good hearing an aviator should possess. The question of equilibrium control brings into action the application of Barany's researches in nystagmus and the pointing reactions, and the experiments of Von Stein.

The determination of exactly the minimum vision for a gunpointer or a signalman, and the visibility of signal lights at sea, are all questions which confront the ophthalmologist afloat, and are in many instances questions which no previous training in the specialty under usual office or hospital surroundings has touched. Many examinations of the vision and the static refractions of gunpointers were

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made a few years ago by Surgeon Grow of the service, and while in isolated instances men with defective vision were found to have excellent records, yet, as a rule, men with no refractive error, all other things being anything like equal, are much more efficient. While very young, and with good accommodation, marked errors of refraction may be overcome; as the man gets in his thirties and the power of accommodation becomes less, these latent conditions gradually become manifest. This of course refers to hypermetropia and hypermetropic astigmatism. Conditions of field service, or where nervous tension exists, may cause relaxation of the accommodation and consequently diminution of vision. A recent case, on board the U. S. S. *Solace*, illustrates that condition. With previous good vision, though a history of having worn glasses, a corporal awoke one morning during a march from Puerto Plata, D. R., on Santiago, D. R., and found that he could scarcely see. On reaching this ship, his vision was about 20/200, each eye. Refraction under atropin showed O. D, plus 4.25=$\overline{C}$ plus 1.25 cyl ax 60 gave vision of 20/20, and O. S. plus 3.50=$\overline{C}$ plus 2.25 cyl ax 120° gave 20/40 plus, increasing later to nearly 20/20 left. Without refraction under a cycloplegic, this man might have been considered a malingerer or a coward, since there was no external condition to account for his symptoms.

Actual malingering is extremely rarely seen in peace times; frequently patients exaggerate their symptoms, either intentionally or otherwise, especially the neurotic type. It was so easy then for men to purchase discharges that malingering for the purpose of escape from the service was rare. The constitutionally inferior are in the service as well as out, and no system of recruiting can entirely eliminate them.

In other espects the specialties run parallel ashore and afloat, in the service and out. As a rule the Government is a generous provider of instruments and equipment, and books of the best are supplied, so that the practice is more satisfactory in many ways than in civil life. Particularly is this true so far as the facilities for a complete examination and study of cases are concerned. A well-equipped laboratory and X-ray outfit can be called upon in any hospital, and in case there is any obscurity in diagnosis, or there exist certain symptoms pointing towards a systemic disorder, of which the eye or ear condition is but a part, general examination can be made and confirmed by the other members of the staff. On the other hand, the specialist is frequently associated with general cases as a consultant, and in this way there is less tendency to become self-centered, and a breadth of view can be maintained.

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LOCAL ANESTHESIA

By Lieutenant Colonel CHARLES R. REYNOLDS
Medical Corps, U. S. Army

IN THE history and development of local anesthesia since the beginning in 1884, five events have occurred to add to its importance or perfect its methods, namely, the use of weak solutions with adrenalin, the discovery of novocain, injection by the intraspinal and venous methods, the use by Crile of local anesthetics in anoci-association operations, and a more careful study of sensory nerve distribution. While it is true that the ideal anesthetic will be one that suspends consciousness without shock or danger, the use of local anesthetics must be considered superior in many cases to any general anesthetic. Local anesthesia is today more popular in Europe than America. In 1909 Neuber's statistics from the clinics of 112 German surgeons showed that 25 per cent of cases which ten years before were given general anesthetics were done under local anesthesia. The Surgeon General's report shows about the same number of operations under local and general anesthetics.

Local anesthetic operations are usually time consuming and tedious and often as nerve racking to the surgeon as to the patient. It is quite natural that surgeons should hesitate to place themselves day after day under such psychic shock-producing stimuli and insist that the patients themselves should stand a share of these anoci-associations. Ether is good enough for many major operations, but for minor operations, and especially in those cases in which the patient's vitality is low and the shock-producing inhalation anesthetic might turn the balance, the employment of local anesthesia alone or with light ether or nitrous oxide is certainly demanded. Ether, while it produces unconsciousness and thus eliminates some of the psychic shock, does not block the afferent tracts to the brain or nerve centers along which may pass the harmful shock-producing stimuli from the mechanical damage in the field of operation. Local anesthetics do block these harmful impulses and so conserve the patient's vitality. This is the basis of Crile's kinetic theory of shock and of the anoci-association operation—an advance in surgery which has brought its benefits to the patient, who needs both his strength and the operation.

Through the pioneer work in neuro-regional infiltration by Halsted,

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Cushing's application of the method to hernia and brain operations, the work of Matas and Braun in widening and perfecting its methods, to Lennauder's studies in sensory nerve distribution and Criles' use of novocain with or without nitrous oxide, the local anesthesia operation has included the cranial, thoracic and abdominal cavities, and almost any operation which is not prevented by mechanical reasons. Trephining, laparotomies, amputations, disarticulation of the shoulder girdle, resections of joints and of the upper jaw are numerous. Hoertel reports 16 resections of the Gasserian ganglion under local anesthesia. In 1915, Webster reported 14 abdominal cesarean sections and Ruge 22 total hysterectomies under novocain. William J. Mayo, in his notes of the clinics of Germany, Belgium and Great Britain, states that he saw Wilms of Heidelberg do two perineal prostatectomies under novocain in three minutes each.

The Various Local Anesthetics.—The most important local anesthetics today are cocain, beta-eucain, tropococain, stovain, novocain, quinine and urea and alypin.

Cocain was the first of these substances to be employed, being used by Koller in 1884 for operations on the eye. At first strong solutions were in use, 5, 10 or even 20 per cent. At the present time those who are doing the most work with local anesthesia employ two solutions, 1 per cent and 1/10 per cent, the first for nerve blocking and the weaker solution for infiltration. The poisonous properties of cocain are well known, but most cases of poisoning have been due to the use of strong solutions. Cocain enters into chemical combination with the protoplasm, having a predilection for nerve tissue, and is then broken up into harmless compounds in which form it is eliminated. Cases of poisoning are therefore due to the employment of solutions containing a quantity of the drug in excess of that which can chemically combine with the protoplasm, the excess only being absorbed into the circulation to affect the higher nerve centers and cause systemic effects. It has been demonstrated that five times as much cocain can be injected into the tissues in a weak solution as in a concentrated solution. The employment of adrenalin and the use of an elastic ligature to block the circulatory absorption of the drug have done much to lessen their danger. The poisonous dose is given by the German Pharmacopoeia as .050 gram. Death has been caused by 7 c.c. of a 1 per cent solution in the urethra. The first symptoms of poisoning are restlessness and dizziness, followed by disturbances of respiration and delirium. The best antidote is amyl nitrite, artificial respiration being relied upon when the respiration fails.

Contrary to the general idea, cocain solutions may be sterilized by

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boiling for five or ten minutes. Only fresh solutions should be used and prolonged and repeated boiling injures the drug.

Beta-eucain is about one-fourth as toxic as cocain and nearly as effective. Anesthesia is produced more slowly and wears off more quickly. A number of cases of sloughing have been attributed to beta-eucain, probably, however, without proof in view of many good reports following extensive use.

Tropococain has been used extensively, especially in spinal anesthesia. It is about one-third as toxic as cocain, is a vaso-dilator and therefore directly opposed to adrenalin, with which it is not to be used. This eliminates it, to a great extent, as a useful local anesthetic.

Stovain, a synthetic preparation first brought out in 1904, has not established itself as superior to cocain or other local anesthetics. Locally it is more irritating and causes to a certain extent a motor paralysis. It is this fact that makes its use in spinal anesthesia dangerous on account of the possible involvement of the respiratory muscles and higher motor centers.

Novocain is undoubtedly the best local anesthetic. Alone it has comparatively feeble anesthetic power, but combined with adrenalin or corresponding synthetic preparations, such as suprarenin, it makes the ideal local anesthetic. It is about one-tenth as poisonous as cocain, absolutely unirritating locally, and its solutions can be boiled without deterioration. While it can be used in solutions as strong as 5 per cent, most surgeons use ½ or ¼ per cent solutions, the former in the Mayo clinic and the latter in Crile's. The employment of these weak solutions has done more than anything else to advance the cause of local anesthesia. By the infiltration method as much as .600 gram (about 10 grains) have been used without poisonous effects. This means that with a 1/400 solution of novocain with suprarenin, you may use as much as desired, even more than 200 c.c.

The anesthetic property of novocain is said to be distinctly increased by potassium sulphate. Braun, who is one of the greatest advocates of local anesthesia in Europe, uses a 4/10 per cent solution of potassium sulphate in normal salt solution.

Novocain solutions must be carefully prepared, by first boiling normal salt solution made with distilled water for twenty minutes, the novocain crystals are added and the solution boiled again for ten minutes. The adrenalin is then added. The novocain-suprarenin tablets of Braun are supposed to be sterile. It is best, however, to sterilize the solution as the suprarenin is a synthetic preparation and is not affected by boiling. Fresh solutions should always be prepared for every operation. Novocain solutions are precipitated by free alkalies. Syringes and

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needles should, therefore, be sterilized in plain water, a matter, however, of little practical importance when using large quantities of the solutions.

Quinine and urea, in the form of the hydrochloride, were introduced as local anesthetics in 1907 by Thibault of Scott, Arkansas, who noted that the point of injection where quinine had been given for malaria remained anesthetic for some time. Quinine had been previously used for anesthetizing the mucous membranes. This remarkable substance is especially valuable because the anesthesia lasts for several days and has been of value in preventing post-operative pain in the incisions, the stitches and the activity of sphincteric and other muscles. Its solutions are distinctly irritating to the tissues and should not be injected into infected areas, for by diminishing tissue resistance such may lead to infection. A number of cases of extensive sloughing apparently have been caused in this way. The most rational method is to inject the tissues at a distance from the incision with a massive infiltration of a 1/6 to ½ per cent solution.

Alypin seems to be the favorite local anesthetic in genito-urinary surgery. By the use of tablet depositors the urethra may be anesthetized, or a 5 per cent solution may be injected into the urethra or the bladder. Solutions of alypin may be boiled for about five minutes.

Adrenalin and allied synthetic preparations greatly increase the anesthetic power of cocain and novocain, but have little or no effect when used with beta-eucaine and tropococain. By its vasoconstricting action it confines or incarcerates the drug in the tissues, lessens systemic absorption, and in addition seems to have a specific effect in promoting the action of the anesthetic, which has been likened to catalysis or the effect of a mordant or fixing substance. In the proportion of one part to a million it has this effect. One drop of a standard adrenalin solution, which is a 1-1000 solution in 20 c.c. of the anesthetic solution, will equal about 1-600,000. The synthetic substitutes can be boiled. Of these, suprarenin and arterenon are about the same as adrenalin. A later preparation known as homorenon is fifty times less toxic than adrenalin and in some clinics is used exclusively.

Plain water may be used for anesthetic solutions; but normal salt is preferable because, being isotonic, it neither gives to nor abstracts fluid from the cells or the nerve substance and therefore avoids the pain of the injection.

The average soldier is a good subject for local anesthesia. The operation is easy in direct proportion to the self-control or nervous strength of the patient. In nervous women and in children it is practically impossible. The preliminary preparation of the patient differs

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from that for an inhalation anesthesia chiefly as regards the diet. The stomach need not be empty, a little food an hour or so before the operation being beneficial. Getting the confidence of the patients is something that almost never happens, for they all expect to be hurt but are willing to chance it to avoid ether. The procedure should, however, be explained, the advantages such as elimination of nausea and vomiting, the ability to eat, drink or smoke soon after the operation, being mentioned, and the patient should be told that at any time during the operation if pain be felt he should say so, as suffering is not a part of the operation and can be easily prevented by the use of a little more cocain. As the operation is likely to be long and tedious, the position on the table should be comfortable, a pad under the small of the back being especially required. The arms should be secured to the sides or across the chest, and someone should be in attendance at the head of the table to take the part of the so-called "moral anesthetist."

About half an hour before the injection is made, a hypodermic of ¼ gr. morphine, with or without scopolamine or atropine, should be given. This is very important, for without it the psychic strain is apparent and the general attitude of the patient is far less satisfactory.

Two solutions should be ready, a 1-400 novocain with adrenalin for infiltration and a 1-100 solution for nerve blocking or injecting hypersensitive or missed areas. If quinine and urea are to be used, a 1-400 solution will be found satisfactory. A 5 c.c. Ricord syringe is the most satisfactory for general work. A fine needle is to be used for the skin and a longer and large one for deep infiltration. For the quinine and urea an angular needle is best so that the area about the operative field can be blocked off. The operation can now be performed by one of two essentially different methods. In the first case the skin itself is infiltrated and each layer is anesthetized as the incision deepens, every nerve being infiltrated as it is found. In the other, the filed of operation from below upward is infiltrated or the field of operation is circuminjected in order to anesthetize the nerves before they reach the skin or operative field. In this case, from fifteen to thirty minutes should elapse after the injection before the operation is begun.

In operating by the first method, with a fine needle the solution should be introduced into the skin itself between its two layers, for the skin is the most sensitive tissue of the body. A wheal is thus formed whose surface is white and pitted, looking like pigskin. Neglect to anesthetize the skin itself is the most common error. Through this wheal to its periphery the needle is passed, another injection made slowly, and so on until the line of incision is covered. In the same way the successive layers are painlessly anesthetized. If the other method is

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chosen—as, for instance, in a hernia operation—the point of the needle, preceded by its wheal, is carried to the entire extent of the proposed incision, infiltrating the subcutaneous tissue, apponeurosis, muscle cord and Poupart's ligament. In half an hour the operation is commenced. If practicable, a constricting bandage should be applied about the part after the injection if cocain has been used. Massage of the injected area is supposed to assist in the dissemination of the solution. In operating in an inflamed area the infiltration should be made around the area and not into it, as this is always very painful and the anesthesia unsatisfactory. Boils, abscesses, carbuncles, and felons can be painlessly incised if the injections are made properly and given time to permeate.

In the general conduct of all extensive operations under local anesthesia, the tissues must be cut, not stretched, pulled or torn, as these procedures cause plain by dragging upon structures quite outside the operative field.

Neuro-regional anesthesia or the nerve-blocking method, by which the sensory nerves of the operative field are anesthetized, either in or remote from the field of operation, was practiced the same year that cocain became known as a local anesthetic, by Halsted, who blocked the inferior dental nerve for the extraction of teeth. As early as 1887, Crile amputated a leg after blocking the sciatic and external cutaneous nerves. In 1900, Cushing greatly advanced the subject of local anesthesia by the publication of his method of hernia operation by paying especial attention to the ilio-hypogastric, ilio-inguinal and genito-crural nerves. Since that time, painstaking investigation as to the sensory nerve distribution, especially by Braun and Lennander, and methods of attacking large trunks have made possible a broad field for local anesthesia. The injections are of two kinds, peri-neural and intra- or endo-neural. The injection into a large nerve trunk is not painful if the nerve is slack. Histologically a few fibers or cylinders have been degenerated by this injection, but clinically no instance of permanent anesthesia or paralysis has ever followed a neural injection of an anesthetic solution.

Venous anesthesia is a method of producing local anesthesia by injecting the anesthetic solution into a vein and was first described by Bier in 1908. The limb is bound tightly from the fingers or toes upward with a rubber bandage as in the ordinary bloodless operation. Above the bandage an Esmarch roller is applied. The first bandage is then unwrapped from the limb peripherally so as to expose the area of operation. Novocain solution ½ per cent, without adrenalin, is then injected into an exposed vein, as much as 50 c.c. being used in the upper and 70 to 80 in the lower extremity. The area between the bandages becomes anesthetic almost immediately and the limb peripheral to the

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distal bandage becomes anesthetic and paralyzed in five to ten minutes. This anesthesia lasts while the bandage remains in position. The method has been found satisfactory for practically any operations upon the extremities. The same method, in which the solution is injected into an artery (arterial local anesthesia), has been used, but possesses no advantages over the venous method.

Intraspinal or sub-arachnoid anesthesia is not obsolete but will continue to have its place in certain classes of cases. Novocain is probably the best drug, although cocain, stovain and tropococain are still used. Crile's experiments with methylene blue injected in this manner showed a very rapid dissemination to the upper regions of the cord, regardless of whether the patient was sitting or recumbent. Stovain's affinity for motor nerves would seem to prejudice its uses on account of the danger of its action on the motor nerves and centers of respiration. The use of adrenalin with the anesthetic is debated, some using it and others omitting it in spinal anesthesia. The chief disadvantages of the method, as stated by Crile, are its effect in cutting off the vasomotor control of the splanchnics and lower extremity, its mortality, the psychic strain produced, the frequent incompleteness of the anesthesia and subsequent headaches.

In applying the principles of local anesthesia to special surgical operations, it is essential that the irritability or sensitiveness of the various tissues of the body should be known, as well as the distribution of those nerves which carry impulses of pain, touch, heat and cold. In general, the integument of the body is supplied with these nerves and is very sensitive. The subcutaneous tissue, fat, fascia and muscles are very much less sensitive and in many places quite insensitive, except in the vicinity of traversing nerve fibers. Periosteum is exceedingly sensitive, bone is insensitive, so are cartilage and fibro-cartilages of joints. Bone marrow is said to be insensitive, although J. F. Mitchell states that the marrow of some long bones is sensitive. Synovial membrane is acutely sensitive. The dura, brain, and most of the internal viscera are insensitive to any of the sensations and may be cut, crushed, or burned without pain. Tumefactions and granulations are also insensitive unless the manipulations result in traction on adjacent structures—a fact to be borne in mind in any operation about the internal organs and viscera.

In operations on the scalp it should be remembered that the skin, fascia, and periosteum receive their nerve supply from below so that the anesthetic solution should be injected below the seat of operation. With the periosteum anesthetized the bones can be drilled, trephined, or gouged without pain. The dura is sensitive only under the oc-

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cipital bone; the brain itself needs no anesthetic as it is insensitive and has no noviceptors. Incisions and lacerations of the brain, therefore, cause no pain or shock.

In operations on the superior and inferior maxilla it must be remembered that through these bones are transmitted the branches of the fifth nerve. The best neuro-regional work ever done has been applied to the fifth nerve. Properly placed injections around the supra, and infra orbital, the posterior, anterior and inferior dental nerves have rendered painless operations on the jaws and the extraction of teeth. Matas has resected both upper jaws and sixteen resections of the Gasserian ganglion have been done by Hoertel.

Operations about the ear and paracentesis of the drum membrane can be done by two injections, one at the upper attachment and the other in the furrow between the articulation and the mastoid, from which the injection is made subcutaneously and along the auditory canal. After applying one per cent cocaine solution to the drum, paracentesis can be painlessly done in ten minutes. The mucous membrane of the middle ear is very sensitive. Although in 1908 forty radical mastoid operations had been done in Politzer's clinic, the operation is certainly one for inhalation anesthesia.

For tonsil operations in adults the peritonsillar injection, that is, about the capsules, is entirely satisfactory. The use of quinine and urea is especially recommended for this purpose.

In the nose, when a limited area is to be treated, the stronger cocaine solutions—5 or 10 per cent—are used, although a 1 per cent solution will suffice if a sufficient time is allowed for it to act.

Tracheotomy is a procedure which in most cases must be done without inhalation anesthesia. Many have been done without any anesthetic. Years ago Brown-Sequard called attention to the fact that in this region the tissues are practically insensitive exactly in the median line. The operation is easily performed under infiltration and the application of the solution to the mucous membrane of the trachea.

Thyroid operations, the ligation of the arteries or poles or removal are entirely feasible under novocaine. As many other matters have to be taken into consideration, and especially the psychic effect, it is often advisable to use nitrous oxide or ether in conjunction with novocain.

For ligation, a horizontal line of incision 2½ inches long across the center of the thyroid cartilage is infiltrated, and a deep injection is made on either side. The thyroid gland itself is insensitive. By a sharp dissection and the avoidance of traction the operation can be done painlessly. Before ligating the poles an injection should be made around the capsule as the tying of the ligature is painful. As a pre-

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liminary operation, Crile does this while the patient lies in bed. For removal of a lobe, after infiltrating the line of incision a deep injection is made into a quadrant to the outer side around the lobe; finally, a massive injection is made along the posterior border of the sternomastoid muscle to prevent the disagreeable drugging sensations necessary in removal. Sixty to 80 c.c. of novocain solution are used.

Operations on the thorax for lung and pleural conditions often preclude the use of ether. Paracentesis, rib resection and incision for abscess of the lung can be done painlessly if it is remembered that the skin, periosteum and parietal pleura are sensitive, the bone and the lung substance being neutral. The infiltration should be made over the rib, in the adjoining interspaces, into the periosteum and behind the rib. The pleura may be injected at first or when it is exposed in the wound.

Complete breast excisions have been performed under local anesthesia. While it is not an ideal location for this method, the minor procedures, such as incisions or the removal of benign tumors, are easily performed under infiltration.

Almost any simple abdominal operation can be done under local anesthesia. If the surgeon is sure of the diagnosis, any chronic appendix, for instance, can be removed; but the method possesses the distinct disadvantage that a thorough exploration of the cavity is not very practicable because of the necessary traction on the parietal peritoneum and other sensitive points. Abdominal incisions present no difficulty whatever, and by making long incisions the infiltration produces a more flaccid and relaxed wall than in the surgical stage of ether.

The nerve supply of the abdominal area has been very carefully worked out. Most of the wall is innervated by the intercostal and lumbar nerves, which course forward between the internal oblique and transversalis as far as the rectus sheath. Perforating and connecting branches supply the skin, muscle, fascia and parietal peritoneum. The diaphragmatic peritoneum, however, is supplied by the phrenic nerve, a point which is of most importance and complicates operations in the upper abdomen. It has been shown that all the viscera which receive innervation from the vagus or sympathetic system are devoid of the sensations of pain, pressure, heat and cold. The stomach, intestines, liver, and practically all of the viscera may be cut, crushed or burned without pain. Traction, however, as it affects the mesenteric or other attachments to the parietal peritoneum, causes pain. This is true also of the kidney, ureter, and bladder. A stone in the ureter or gall ducts causes pain by disturbing the investments of those ducts, especially in the presence of inflamed tissue.

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Crile, in advocating the use of local anesthetics in abdominal surgery, either alone or with nitrous oxide, as a part of anoci-association, gives a hypodermic of 1/6 grain morphine with 1/150 scopolamine one hour before the operation. The skin line is then infiltrated, and the incision is made through the fat, which is practically insensitive, to the fascia. This is infiltrated and cut, then the muscles, posterior sheath and finally the peritoneum are treated in the same way. When the abdomen is opened a massive injection of the wall, at a distance from the incision on each side, is made with quinine and urea. Crile lays down these general rules: Make large incisions, avoid rough handling of tissue, traction on the parietal peritoneum and mesenteries, use retractors gently, and avoid gauze pads and sharp dissection.

As thus performed, the surgeon has the advantage of a well-relaxed wall, which avoids extrusion of intestinal coils, does away largely with gauze pads, in the post-operative period avoids nausea and vomiting and gas pains, and causes fewer cases of hypostatic congestion of the lungs, by permitting the pain-free muscles to take their part in the process of respiration.

In operations on the anus and rectum it should be realized that the anal skin and mucous membrane are exceedingly tender, but the upper rectal membrane is quite insensitive. Injections should be made at a distance from the muco-cutaneous junction and the solution carried inward. External hemorrhoids, fissures and fistulas may be easily treated by simple injections. Internal hemorrhoids and operations requiring complete relaxation of the sphincter are more easily done under ether. But with novocain it is possible to stretch the sphincter fairly well without much pain. The novocain solution should be injected in four places around the annal margin, then the sphincter is infiltrated with a guiding finger in the rectum. Finally quinine and urea are thrown in about the sphincter to control the post-operative period. In this hospital[1] for some time past, after ether operations for hemorrhoids the area about the sphincter has been infiltrated with quinine and urea. The post-operative period is quite painless. I have often doubted the entire safety of this procedure on account of the poor resistance of the ischiorectal region with its terminal blood supply and proximity to infected areas.

Gynecological operations have been performed under local anesthesia, but this method is not well suited to these cases. Krause, by an ingenious method, has dilated and curetted painlessly by the use of Hegar's dilators coated with a syrup containing novocain and adrenalin.

Hernia and varicocele and all operations on the scrotum and tes-

[1] Department Hospital, U. S. Army, Honolulu, H. I.

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ticles are well suited to local anesthesia. For some time, all hernia and varicocele cases at this hospital have been operated under novocain with entire satisfaction. For the hernia I prefer the deep preliminary injection of fascia, aponeurosis, muscles, cord and Poupart's ligament, waiting a half-hour after the injection. The upper or outer part should receive a good injection to catch the iliohypogastric nerve which supplies the skin. The area at the neck of the sack is injected before tying. For varicocele, the transverse injection is used and with good infiltration of the cord there should be no pain. In operations on the scrotum and testicles the neck of the scrotum should be infiltrated all around, being careful to include the suprapubic and perineal areas of attachment. Infiltration of the cord will then be sufficient, unless the operation is to involve the testicle itself; in which case an injection should be made about the hilus and epididymus, as these places are sensitive. The "bottle" operation for hydrocele is easily done under local anesthesia.

Circumcision is essentially an operation for a local anesthetic. Of the many methods, a satisfactory one is to fill the prepuce with 1 per cent cocaine and adrenalin solution and, after a few minutes, infiltrate the skin line, cut and reflect, infiltrate the mucous membrane from the skin side and slit it, then infiltrate the line of incision in the mucous membrane with special attention to the area of the frenum. Massive infiltration of the base is also employed.

Urethral operations, exposure of the bladder by the suprapubic method and prostatectomy by either route are operations that often preclude the use of ether. The urethra can be anesthetized by 5 per cent alypin, 1 per cent cocain or novocain solution. All operations on the bladder should be preceded by the injection of 60 to 80 c.c. of 5 per cent alypin, 1-1000 cocain or novocain solution introduced into the bladder through a catheter, which is left in. In exposing the bladder after infiltration care must be taken to avoid traction, which is intensely painful in the presence of acute inflammation. The prostate is removed after injecting the solution into the bladder mucous membrane and about its capsule.

In operations on the extremities, nerve blocking and attention paid to the sensibility of the various tissues will allow many of the major extension operations. The muscles and tendons are slightly sensitive and so are the ligaments, except that of the patella. The periosteum and synovial membranes are exquisitely sensitive. In operations on the fingers and toes it is necessary to infiltrate in the vicinity of the four nerves, two anterior and two posterior. It is said that the intravenous method allows all kinds of bone surgery, the reduction of fractures, wiring, plating, operations for necrosis and joint operations.

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BRIEF STUDIES IN FLAT FEET[1]

By Lieutenant Colonel GEORGE H. R. GOSMAN, M. C.
and Lieutenant H. P. PERRY, M. R. C., U. S. Army

(With six illustrations)

IT IS a safe and true saying and quite beyond dispute that any soldier's efficiency, whether he is of infantry, cavalry, provisional field artillery, or any other department of the service, is only equal to and parallel with the integrity and soundness of his feet.

Any soldier who through any deformity of his feet is unable to go the limit of muscular exertion that his musculature will permit, is himself not only below par in efficiency but because of his inefficiency, the efficiency of the entire company is lowered, as any man invalided for any reason whatsoever, removes from activity at least one and usually two others from the immediate field of operations.

It is the purpose of this paper to discuss flat foot in the soldier, its prevention and treatment among men in the military service of this country. The opinion and deductions herein expressed and deduced are based upon observation of these cases and the treatment carried on at Fort Ethan Allen since August 1, 1917.

During August at the 18th Cavalry Camp, talks of instruction were given to the troops twice or three times each week, a definite plan of exercises inaugurated, and personal attention given to many individual cases.

The results were most gratifying, even though the exercises were not personally supervised at all times by a medical officer. The men were then allowed to conduct and carry on the exercises without supervision or instruction beyond what was embodied in the lectures to the troops. In this regiment alone, about 300 men were found with distinct symptoms referable to flat feet. Over 80 per cent of these men were within a month made thoroughly efficient.

Since September 17, men from other regiments have been under observation and treatment at the Recruiting Barracks Hall in squads of forty or less. The results noted and the form of exercises are detailed in this paper.

Talipes planus, for the sake of some form of classification, is divided into three groups, the first, second, and third degrees.

In recruiting examination papers this classification is the one considered and papers are marked, "with or without symptoms," meaning subjective symptoms, namely pain, impaired motility or lameness, as admitted by the man under observation. Men who in civil life acknowl-

[1]See The Military Surgeon, August, 1917, p. 219.

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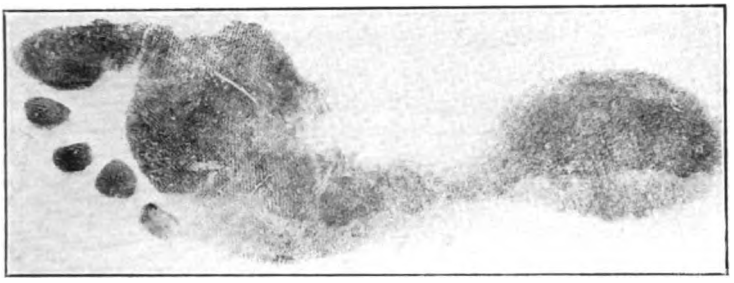
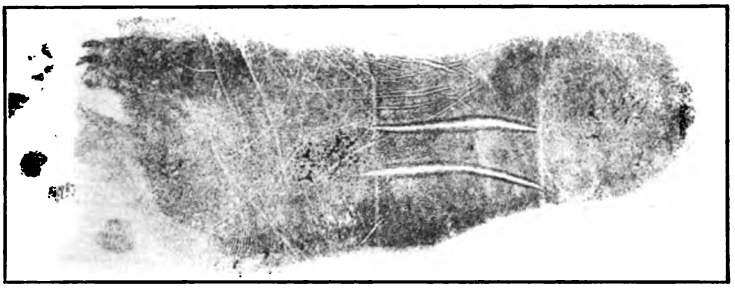
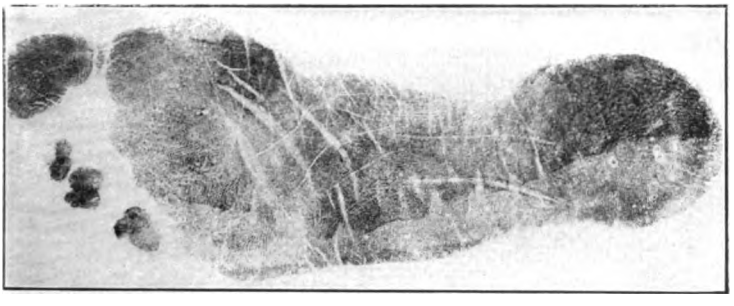


NORMAL LEFT FOOT IMPRINT.



FLAT LEFT FOOT IMPRINT BEFORE EXERCISE.



FLAT LEFT FOOT IMPRINT AFTER TWO WEEKS' EXERCISE.

Imprints are made by applying ordinary finger print ink to sole, after which the foot is placed on the paper lying on the floor and the man directed to stand squarely upon it.

(To face page 56.)

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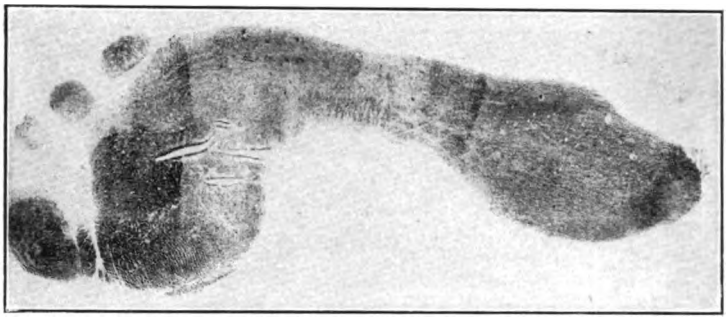

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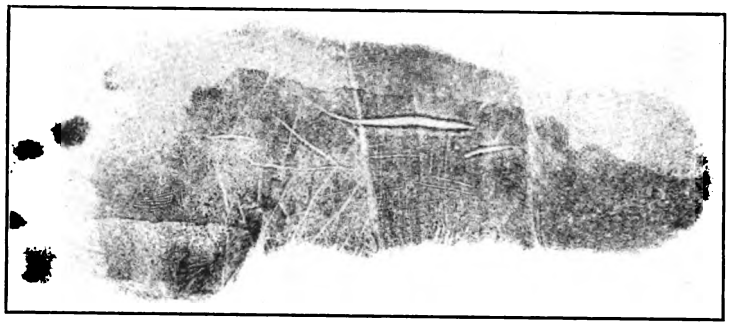

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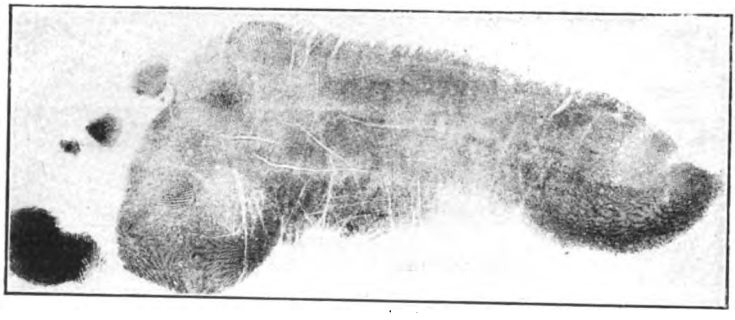

FLAT RIGHT FOOT IMPRINT AFTER TWO WEEKS' EXERCISE.

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edge no impairment or disability are marked symptomless on the examination papers and are enlisted.

Observation and study of this class of cases compel the conclusion that every case of flat foot does give symptoms sooner or later if subjected to intensive training.

Though it is not intended in this paper to quote statistics, a few approximate figures may not be inappropriate, the endeavor being in quoting figures to lean positively to the ultra conservative side.

In about 2,000 cases examined and closely observed at various recruiting stations throughout New England, the writers estimate that about 30 per cent, or about 600 men, suffered from flat foot either of the first, second, or third degree. Of these 600 men about 60 per cent were subjectively without symptoms and were accepted for enlistment. From this it is only a matter of mathematical calculation to determine, in an army of two million men, that a considerable percentage will be made up of men with flat feet.

Symptomless flat foot in civil life leaves the symptomless class in a very short time after admission into the army, with its system of intensive training. In from one month to five, over 50 per cent of the men who have first or second degree flat foot become to a greater or less degree inefficient, and it is our observation that it is a greater rather than a less degree. It is not intended to convey by what precedes any criticism of the recruiting examiner or his work. We do think, however, that with the experience and knowledge gained in constructing a new army, the exclusions from the services of first and second degree of flat foot will be greater than now.

It is not within the scope of this paper to discuss the recruiting officer's work, but rather to discuss some plan of treatment of *Talipes planus* applicable to condition and environment as found in the army, that will not only produce results, but will be entirely possible to carry out without *materially upsetting military training.*

In orthopedic practice in civil life it is not difficult for the man or woman under treatment to be put at rest at home or in the hospital. It is not a hardship though, perhaps, a drain on the purse, to go to the doctor two, three, or four times each week for treatment; neither is it difficult to find a shoe dealer who will sell a proper arch support apart from the shoe, or mayhap one may be compelled to pay a large price to have the arch support made a part of the shoe itself. Obviously the soldier in training can have none of this and, furthermore, we are convinced that any form of artificial support to any arch is decidedly detrimental.

The recruit in the United States Army is at once started on his course of muscle building, muscle training, through setting up exercises,

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and drills on foot and on horseback. Close attention to soldierly bearing is given. In fact everything is done to make him a real man, and one only needs to see the raw recruit on his arrival at an army post and to see the same man three or four months later, to note the change. Close attention during his entire training is given to every part of his body, except his feet.

The anatomy of the bony structure of the plantar arch, the muscles of the foot and leg are quite familiar, hence a detailed anatomical review is not necessary. Neither need much, if anything, be said regarding symptoms, because the purpose of this communication is chiefly to call attention to the plan of treatment at Fort Ethan Allen, Vermont, that has been found effective and satisfactory.

Up to the time of this writing there have been about 400 cases under observation and treatment at Fort Ethan Allen. From these cases it seems that in giving a prognosis the degree, as determined by foot imprint alone, is not especially definite or positive. It does not give very much of an idea of the curability of the case whether it be of the first, second or third degree, except in a broad sense. Any opinion formed thus is largely dependent upon the observer's eye. The degree of adduction, of eversion and the degree of immobility of the toes and ankles are, however, in our opinion the determining factors as to whether the given case can be cured sufficiently to be retained in the service, as an efficient atom of a great army, or whether the case is one for discharge.

In the group of cases under observation and treatment, that have been recommended for discharge, there are six cases, all of which have been improved, as far as improving the arch is concerned, but have, despite treatment, been unable to overcome a marked degree of rigidity of the toe joints and the ankle joints. Therefore we conclude that any case of flat foot can be cured and made a useful foot, well able to bear the intensive training of the army routines, provided the inflexibility or rigidity is not of such an extreme degree as to render impossible, by proper exercises, a complete development of such muscles as are essential to proper support of the foot bones.

It is not so long ago that the gymnasium instructor advocated dumb-bells, of greater or less weight, in all drills and exercises, in fact muscle-resistance apparatus were gymnasium indispensables.

Gradually these have been reduced in weight until now very few dumb-bells are used, and the system of muscular nonresistant exercise has become the one used to develop flexible useful muscles.

In order that the systematic exercises of the foot muscles may be carried out successfully, the leg should be free from all restraints. Shoes and stockings should be removed. Under-drawers and breeches should be so arranged as in no way to restrict muscular action.

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The toe exercises are the first ones taken up.[2] The men are stood on a raised platform, a two-inch plank is quite enough; they are then directed to flex the toes to the extreme point of flexion with a hard pull of the flexor muscles of the sole of the foot at the extreme point of flexion. This is followed by extension without effort. This exercise is repeated continuously from five to ten minutes, the shorter period at the beginning, gradually lengthening the time of this particular exercise until the full time is possible without fatigue. The second exercise is a continuation of this flexion of the toes on the sole of the foot, bringing into action the *Tibialis anticus* muscle. At the extreme point of inversion or adduction, a strong, hard pull is made, then the foot is allowed without any muscular effort to resume its usual position.

At the beginning, fifteen or twenty minutes are sufficient for the entire routine of exercise. Later, after the muscles become stronger, a full half-hour may be devoted to this without marked fatigue.

The plan as outlined above has been carried out each morning under the supervision, after the first few days, of an enlisted man of the Medical Department.

The patients have been instructed to repeat this performance each night on retiring, devoting one-half the time consumed in the morning.

Many of the cases with marked inversion or adduction of the foot walk with the toes turned out. The men are instructed to walk with the toes turned in at all exercises and at all times during the day. We believe that this latter advice relative to walking is vitally important in the general handling and treatment of these cases.

The following conclusions have been reached as the result of the work at Fort Ethan Allen, in the observation and treatment of flat foot.

1. That subjectively symptomless flat foot, in civil life, quickly becomes a source of trouble and invariably gives acute symptoms under the burden of intensive military training.

2. That any given case objectively showing a flat arch, even though of the first degree, should be rejected for enlistment, unless all motions of the toes and ankles are free to the extreme degree.

3. That the system of recording the degree of flat foot inaugurated at this post indicates, by comparison, the degree of improvement in motility under muscular exercise properly conducted.

4. That the method employed at Fort Ethan Allen since August 1, 1917, in the treatment of flat foot is the plan best adapted to the needs of men in the army undergoing intensive military training.

5. That the *non-resistant* exercise plan is most effective and shows results well calculated to make its adoption in military practice advisable.

[2]See THE MILITARY SURGEON, August, 1917, p. 219.

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AUSCULTATION OF PULMONARY APICES IN YOUNG MEN

By First Lieutenant JOHN T. KING, Jr.
Medical Reserve Corps, U. S. Army

AN examination of over twenty thousand men for tuberculosis has recently been completed at Chickamauga Park. While the present notes are in no wise intended as a report of the board's work, yet certain observations were made upon possible sources of error in the diagnosis of apical tuberculosis, which might prove of interest not only to those in civil practice, but especially to medical men who are just entering or continuing similar examining work among the military forces.

In the diagnosis of pulmonary tuberculosis on a large scale among men in camp, the essential object is the discovery of the largest number of tuberculous men in the shortest possible time. Laboratory methods are, of necessity, in abeyance to those of physical diagnosis. Sputum examinations are very rare, for the reason that a vast majority of soldiers with manifest tuberculosis produce little or no sputum. In this and other respects there is a difference between the diagnosis of tuberculosis in such routine examinations and similar work in civil practice. Most of the soldiers found to have the disease have few or no symptoms. The writer does not recall an instance in which such a man has felt sick enough to report at sick call to his camp surgeon; while this was not inquired into in any routine manner, it is a fact that most men with physical signs of tuberculosis have no insight into their condition. X-ray examinations may be available in camp, but it is obviously desirable, in time of war, at least, to obtain results by the least circuitous path that offers itself. Therefore, any refinement of method in physical examination which enables an examiner to detect tuberculosis in an infected soldier, or to exclude it in the case of a malingerer, will be of very practical importance in the present war.

The vast majority of physical signs of tuberculosis occur in the upper lobes. A large percentage of these signs are limited to the apices of the upper lobes. Moreover, probably at least one-half of the cases in which the signs are entirely above the clavicles, or at the apices behind, present no physical signs of tuberculosis beyond certain râles which we interpret as indicating the probability of an early tuberculous lesion. This is especially true in these military precautionary examinations, during which many cases are discovered in their very incipiency. Therefore, if we are to disqualify large numbers of men in whom are found certain sounds over the clavicles, which are interpreted as being

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tuberculous râles, it is of the utmost importance that the examiner know to a nicety the sound and characteristics of a tuberculous râle; but, what is more important, he must be able to exclude with equal nicety other adventitious sounds of no significance.

After the work at Chickamauga Park was well started, it began to be clear that soldiers presented a problem in physical examination which had never been fully appreciated by any member of the board in civil work. A large number of men showed certain crackling sounds during auscultation, in the supraclavicular fossae especially, which in many cases so closely simulated râles, that their identification became the most difficult problem which had to be solved. During the latter part of the work, the writer kept a list of the men he examined, with observations of the various confusing factors which arose during auscultation of the upper lobes. These observations were crystallized and amplified by discussion with other members of the board, all of whom were interested in the same problems.[1]

Incidence of Normal Adventitious Sounds.—Notes were kept of adventitious sounds in the upper lobes in the examination of 819 men. As the examinations were brief, and the surroundings not conducive to a perfect examination, only such sounds as were brought to the examiner's attention without especial search for such are noted. In 33 cases (4 per cent), crepitations were heard at or near one or more joints. Most of such sounds emanated from the scapulae, the costo-sternal and sterno-clavicular articulations, and from the joints at the shoulder anteriorly. In 23 instances, certain crackles, usually rather loud and explosive, were heard for one or a few respirations at the apices, disappearing promptly during continued breathing. In 17 cases (2.07 per cent) there were found the persistent apical clicks or crackles, of the type which had proved so often confusing. The importance of recognizing and disregarding such sounds is obvious, when one realizes that for each man who is found to have tuberculosis, more than two men will be found who present crackling sounds at the pulmonary apices of no significance.

Literature.—The common sources of error in auscultation are amply treated by text-books, except the apical crackles, which are easily the most confusing sounds encountered in the examination of soldiers. This is probably due to the fact that such sounds seem to be much more common among muscular young men than among persons of varied ages.[2] No mention of them was found in a brief survey of the text-

[1] The other members of the board were: Capt. J. Albert Chatard, president; Lieutenants A. G. Compton, J. J. Stack, J. E. Gammon, J. H. Haldeman, James McNall, F. D. Spencer; Contract Surgeons S. P. Child and W. H. Schroeder.

[2] Rosenbach: *Berl. klin. Wchnschr.*, 1876, xiii, 325.

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books by Da Costa, Cabot, Gerhardt and other authorities. Flint describes certain pulmonary crackles, which he says were first noted by Fournet as "*râles de craquement.*" Flint explains the origin of such râles as due to the separation during inspiration of the walls of a few cells which have become adherent, in the presence of a small quantity of glutinous exudation. Most of such sounds, Flint says, are indicative of early tuberculosis, but occasionally they occur in the healthy chest, in which case they are transient. He found them in two instances during the auscultation of 24 healthy chests. They were probably similar to the transient sounds noted above as occurring in 23 cases in this series. Laennec describes no apical crackles occurring in healthy individuals. Dr. Walshe has a good description of scapular and other sounds originating in the thoracic parietes, but makes no mention of apical crackling sounds. Bushnell[8] describes the various sources of error in chest auscultation, and refers to certain muscle sounds over the apices which were noted by Rosenbach over forty years ago. Roughly translated, Rosenbach says:

> In apical auscultation in the supraclavicular and supraspinous fossae and in the interscapular regions, one often hears at the height of inspiration crackling sounds, which very cleverly imitate rare, small, dry râles. Sometimes they are like pleural rubs. In children and in strong young men, I have frequently heard this sound during vesicular, clear breath sounds. The sounds do not clear after coughing; they remain the same as long as one cares to listen. They are of importance in the diagnosis of tuberculosis, but the text-books contain no note of them. The sound probably comes out of the muscles upon which the stethescope rests. It can be reproduced by gently moving the muscles while the patient holds his breath. It could not be due to friction against the skin.

Recognition of Adventitious Sounds. Joint Crepitations.—In many instances sounds originating in the joints are of such grating or groaning quality that they can be recognized at once by their sound. This is especially true of sounds from the scapular regions. Other types of scapular sounds, however, are crepitant, and demand further study. Dr. Walshe says that such sounds clear readily after a few brisk movements of the arm. Bushnell advises placing the subject prone upon a high couch, his arms dangling loosely on each side. This can be equally well accomplished by having the subject bend his trunk well forward from the waist while he stands, at the same time allowing his arms to hang loosely. Another simple procedure is to have the man grasp a support at a level about as high as he can reach, and, with his hands well apart, put enough weight on his hands to draw the scapulae well

[8] Bushnell, Col. G. E.: *Medical Record*, January, 1912.

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apart and hold them in a fixed position. Putting the arms around a tree over the head was a valuable method in some cases. Sometimes the act of folding the arms across the chest to such a degree that the hands grasp the opposite shoulders causes scapular sounds to disappear. Such procedures are so simple that it is unfair to disqualify a man who presents adventitious sounds and no change in breath sounds in the interscapular region, without first subjecting him to one or more of the above maneuvers, to rule out the possibility of the sounds originating in the chest wall. Certain perfectly healthy men showed sounds in the interscapular region which were supposed to be râles, until they disappeared entirely or very markedly diminished after separation of the scapulae.

Sounds occurring over the upper front, coming especially from the sternal articulations, are often confusing, but are well described elsewhere. They are heard at or near the sternum and may be transmitted laterally along the ribs. They often simulate closely subcrepitant or crepitant râles. However, their location is characteristic, and the sounds lack a dull, sticky quality which would be found in a fine tuberculous râle occurring in the course of vesicular breath sounds. On the contrary, the sternal sounds are usually fine, dry, sharp crepitations; their size varies, but they retain the sharp, dry quality. These sounds can sometimes be eliminated by having the subject throw his shoulders back as far as possible, thus putting the lateral articulations of the sternum under tension.

Transient Apical Crackles.—These sounds, being transient, are of no practical importance. They are identical in quality with the persistent apical crackles described below. They occur as an explosion of crackling sounds, usually rather coarse, usually during only one respiration. One gets the impression that the neck muscles move with less friction after this initial breath. They are too loud for intrapulmonary sounds as a rule, and certainly originate in the parietes, probably in the neck muscles. They are probably sounds of origin identical with those heard by Flint in 2 of 24 healthy chests. Also, such transient crackles are almost invariably too coarse and sharp to be confused with so-called "atelectatic" râles. Bushnell[4] doubts the existence of marginal râles due to atelectasis in the healthy individual, believing them due to friction of the normal pleura. At any rate, such sounds seem of great rarity among young men, at the apices, though they are frequently heard anywhere over the complementary space, where the two surfaces of parietal pleura are approximated. With the exception of a case of probable apical fibrinous pleurisy, which was shown to the

[4] Bushnell, Col. G. E.: *Medical Record*, December 21, 1912.

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writer by another member of the board, he does not recall an instance of transient or persistent adventitious sounds above the clavicles which he considered to originate from either pleural friction or from atelectasis.

Persistent Apical Crackles in Healthy Men.—Such sounds are more dificult to distinguish from true râles than are any other adventitious sounds heard in the upper lobes. Occurring in over 2 per cent of normal young men, the possibility of their presence should always be eliminated before a subject, who shows nothing abnormal except "râles" at the apices, is considered to be tuberculous. These sounds are of various sizes, usually rather sharp and coarse, occurring singly or in sequence. A single click at the apex, persisting at the same phase of inspiration or expiration, or both, of constant quality, in the course of normal breath sounds, not influenced by cough, should be classed in this group of normal sounds. If the sounds are multiple and very course or sharp, they are readily recognized as of no significance. If the sounds occur, as is frequently the case, during both phases of respiration, are of constant quality, not influenced by cough, and are associated with no other changes, they are presumably in the same category. Sometimes the sounds are heard clearly when the stethescope is directed inward over the clavicle toward the neck muscles, and at the same time similar sounds of less intensity are heard laterally over the lung tissue. This fact should always make one suspect the presence of normal adventitious sounds.

Rosenbach states that normal apical crackles are not so apt to be sharply localized as are true râles. However, the supraclavicular fossa does not contain much lung surface, and it is difficult to say that râles are to be found in one part of supraclavicular lung and not in another. It is the presence of the sounds in greater intensity medially, near the long neck muscles, that is more important in the identification of spurious râles. The sounds are sometimes heard at the apices behind, and below the clavicles, but such are rare compared to those heard above the clavicles. The effect of cough on true râles is well known, especially if the cough comes at the end of expiration; râles usually occur in showers after such a procedure. Usually cough has no effect upon normal apical sounds, but this is not always true. At times a cough accentuates them for one or two respirations; this is probably due to a temporary change in the relative position of the neck muscles, caused by the cough. If none of the above recognizable features of normal crackles is present, the examiner should resort to changes of position of the head to prove the sounds of muscular origin. There are many cases in which apical sounds are extremely difficult to distinguish from medium or coarse moist râles. In such cases the writer has been forced

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to rely upon the variability of the sounds with change of the head's position as the sole criterion. They are usually most intense when the subject is in the position customary during examinations—with the face turned away from the side which is being examined. Sometimes the sounds clear or diminish when the face is turned forward, or when it is turned slightly toward the side that is under examination. Probably the most helpful procedure is to have the subject put the chin as far upward and backward as he is able. This extends the neck muscles and diminishes friction during respiration.

Rosenbach reproduced the sounds by moving the neck muscles while the subject held his breath. The neck muscles or tendons are obviously the cause of such sounds. The writer cannot, however, agree with Rosenbach that these sounds are to be heard only at the end of inspiration; they are probably most common near the end of inspiration, but they may be heard throughout inspiration, and not infrequently are heard during both phases. During all these examinations the men breathed through the mouth. Therefore, the nasopharynx was eliminated as a possible source of extraneous sounds.

The dull, sticky, inspiratory shower of râles is such a constant finding at some stage of early tuberculosis, that an examiner is very apt to consider a man who shows such signs, even with nothing else, as tuberculous. However, the greater relative frequency at the apices of normal muscle sounds, which may almost exactly simulate true râles, indicates that every method which will tend to differentiate the two types of sounds should be employed before a diagnosis is made.

SUMMARY

1. In the examination of 819 soldiers, 33 instances of joint crepitation were noted. Such crepitations often simulate true râles, but may usually be caused to disappear by simple expedients.

2. Twenty-three instances of transient apical crackles were found among the same men. Such sounds probably originate in the neck muscles. Marginal lung sounds or "atelectatic" râles were not noted above the clavicles.

3. Seventeen men (2.07 per cent) presented persistent apical adventitious sounds, which were often extremely difficult to distinguish from râles. They are probably unusually common in muscular young men, and constitute the most difficult problem in the diagnosis of early apical tuberculosis by physical examination. These sounds undoubtedly originate in the neck muscles, tendons or fascia. They can usually be caused to disappear or diminish by changing the position of the head.

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EDITORIAL

THE STORY OF THE THREE TABLETS

Listen to the enthralling story of three memorial tablets.

1. On the wall of the library of the Naval Medical School is a bronze tablet. The inscription closes with the eloquent and thrilling motto, "Duty Stronger than Love of Life." What is the story of which this is the flower and the epitome?[1]

On June 12, 1881, the Arctic exploring steamer *Jeannette*, after drifting hopelessly for twenty-one months in the grip of the relentless ice-pack, was crushed by the ice off the bleak shore of Siberia. The leader of the expedition was Lieutenant Commander George W. DeLong. The medical officer was Passed Assistant Surgeon James Markham Ambler. Both were officers of the United States Navy.

On June 17, the officers and crew, thirty-three in all, began their perilous retreat over ice and water and land, dragging three boats and five sleds weighing respectively from 2,300 to 6,000 pounds. Often they had to traverse 13 miles to drag the whole outfit only one mile. In a gale the cutter in which were DeLong and Ambler with twelve others became separated from the other two boats and on September 17 reached land, with provisions for just six days! Had they known it, only 25 miles away was a village and safety, but alas, it was not shown on any map! Oh, the pity of it!

Occasionally a little game was obtained, but finally matters grew so desperate that on October 9, when the only food left was 2 ounces of alcohol per man, two of the party, at Ambler's suggestion, were sent ahead in the forlorn hope of finding succor. On October 22, when these two in turn were too weak to travel farther, a wandering native found and rescued them.

The other twelve crawled on steadily, losing one after another from death by starvation until on October 30 DeLong, Ambler and the Chinese cook alone were left alive. These three "struggled along a few hundred yards farther and laid themselves down on the snow for the last time."

On March 23, 1882, Chief Engineer (later Admiral) George W.

[1] This incident particularly interests me as I knew Admiral Melville for a number of years, especially in the American Philosophical Society. I seem to have been favored in knowing Polar explorers, for Dr. Elisha Kent Kane, another of the Medical Corps of our Navy, one of the early Arctic explorers, was a fellow-townsman in whose exploits, as a young lad, I felt a pride though I never knew him personally. I well remember with what avidity I devoured his book.

During the Civil War for some months under Dr. Kane's surgeon and successor in Arctic adventure, Dr. Isaac I. Hayes, I served as the Assistant Executive Officer, while Hayes was the Surgeon-in-Chief at the Satterlee Hospital and the lateJohn S. Billings was the Executive Officer.

Admiral Peary, again of our own Navy, has long been a friend and was once a surgical patient. Sir Ernest Shackleton I have met repeatedly in Edinburgh and in this country. I have also met Amundsen. Happily I escaped meeting Dr. Cook.

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Melville, also of our Navy, who with the whaleboat party had found help, after long search discovered their bodies frozen by the cruel ice which then, having sated its vengeance, seemed to relent and preserved them for reverent burial at home.

The commander, DeLong, had offered Ambler the chance of life by being one of the two sent ahead, but in his pathetic and noble journal he says, "I thought my duty required me with him and the main body for the present!" "Duty" was indeed "stronger than love of life."

"Certainly," says Medical Director Gatewood, "that party never lost its trust in God. While perishing there was divine service. Day by day trembling lips uttered the Creed and the Lord's Prayer." Discipline was maintained. Personal as well as official rights were recognized. The strong helped the weak. "There was never even a disregard for the proprieties!" They were American gentlemen, members of that corps of the United States Navy which knows not only how to live but how to die. Even the Chinese cook was worthy of equal praise and honor.

2. In the Johns Hopkins Hospital is another bronze tablet to the memory of Jesse W. Lazear, Acting Assistant Surgeon in our Corps in the United States Army, one of the Yellow Fever Commission, who died of yellow fever contracted in the line of duty. The fine inscription written by President Eliot reads as follows:

WITH MORE THAN THE COURAGE AND DEVOTION OF THE SOLDIER HE RISKED AND LOST HIS LIFE TO SHOW HOW A FEARFUL PESTILENCE IS COMMUNICATED AND HOW ITS RAVAGES MAY BE PREVENTED.

He knew well the risk he ran, for the way in which yellow fever was transmitted, though then unproved, was suspected. He, a non-immune, undertook the especially dangerous work with the mosquitos themselves. Like Ricketts he accepted the challenge of death and lost. No! No! Not so! They both *won* Immortal Life! Happily there was no suffering of months in Lazear's case. The disease—yellow fever—laid its heavy hand upon him, and his noble, gentle spirit soon took its flight to the bosom of God and rests there forever.

3. In far-away Ecuador in the outskirts of Guayaquil, you will find the third tablet no less inspiring than the other two. It records the heroic conduct of Passed Assistant Surgeon William M. Wightman of the Public Health Service, who died of yellow fever on May 16, 1909. It is of enduring bronze—"*aere perennius*"—and was erected by his appreciative fellow officers of the Public Health Service to commemorate his sacrifice to duty.

In the absence of Surgeon General Blue, Acting Surgeon General A. H. Glennon writes the brief but pathetic story of his illness. "Although suffering from an attack of dysentery, he persisted in staying

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at his post. On the evening of May 11, he had the chill which marks the onset of yellow fever, but knowing that his immediate superior was out of town, he got up to conduct the preventive measures for which he was detailed to Ecuador. When he was finally forced to give up, the disease ran a short period and terminated fatally."

Far from country and friends, faithful to the duty entrusted to him, faithful even unto death this simple record, brief but eloquent, reads as follows:

"WILLIAM M. WIGHTMAN, PASSED ASSISTANT SURGEON,
U S. PUBLIC HEALTH AND MARINE HOSPITAL SERVICE
MAY 18, 1857—MAY 16, 1909.

"GREATER LOVE HATH NO MAN THAN THIS THAT HE
LAY DOWN HIS LIFE FOR HIS FRIEND."

God grant that we, of these three noble associated medical services, especially in these terrible yet noble days of a war for world freedom, for Civilization over Barbarism, for right over brutal might may be enabled to equal these three men in the splendor of their devotion to their corps, to their country and to humanity.

When the editor of THE MILITARY SURGEON asked me to write a few words addressed especially to the young medical men now flocking by thousands to the help of our dear country, men who are necessarily ignorant of the traditions and examples of the three Government Medical Services, I first intended to give a brief résumé of the scientific services of the three corps.

In the Army I would have recalled the name of William Shippen, who during the Revolutionary War anticipated the celebrated "Flying Ambulance" of Larrey; the work of the first physiologist in America, Beaumont, and his patience and generosity, as well as his professional skill with his unruly patient, Alexis St. Martin; of the splendid scientific work done by Weir Mitchell and many others during the Civil War; of Letterman, my old chief in the Army of the Potomac; the bacteriological work of Sternberg; the splendid record of Hoff in stamping out smallpox in Porto Rico; the yellow fever services of Reed and his colleagues in Cuba and of Gorgas in Panama, the typhoid work of F. F. Russell, and many other achievements in the Army.

In the Navy I had in mind to relate the heroic death of William Longshaw, whose gallantry was twice recounted on the deck of sixty ships of war. He was killed in the assault on Fort Fisher, January 15, 1865, while binding up the wounds of a dying comrade. Their dead bodies were found lying side by side the next morning.

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I had in mind also to relate the fine scientific work of Rixey, Gibson, Bell, Gatewood, Stitt, Beyer, Braisted, and others.

In the Public Health Service, I would have shown how the health of the whole nation and especially our protection from the ravages aforetime of yellow fever and still of smallpox (for shame) and of cholera, plague, and typhus; of the confident audacity of Waterhouse, Professor at Harvard and at Brown, and Surgeon in Charge of our very first U. S. Marine Hospital at Boston, Mass. (only two months after Jenner's announcement of the efficiency of vaccination he obtained the virus from England, vaccinated his own children and then exposed them to infection without harm); of their life-saving researches in typhoid, hookworm disease, measles, pellagra and rocky mountain spotted fever; fearlessly facing death, deliberately selecting the places where disease was *most* ruthless. Some of them are known by reason of valuable researches, many of them are the silent faithful modest heroes known only to the Recording Angel who has writ their names high in the roll of fame.

But Col. C. C. McCulloch has done this far more completely and authoritatively than I could do it for the Army. The scientific achievements of the Navy and of the Public Health Service await a similar historian. I hope before long to see such histories published in THE MILITARY SURGEON. They would foster an *esprit de corps* which would thrill all men new to the services and maket hem proud to wear the uniform of their several corps.

This task is too large for a simple paper like this. I have, therefore, to be content with the touching "Story of the Three Tablets."

Meantime the Great War is telling anew the old unselfish devotion to duty of our predecessors in the sacrifices of our present heroes.

Never before have there been so many casualties in the medical services. In this war, surgeons, while presumably classed as "non-combatants," share danger equally with the line officers. And they are not a whit behind the latter in bravery and devotion.

My own first commission is dated July 1, 1861, as first lieutenant in the Massachusetts Fifth. I was sworn into the service of the United States on July 4, 1861, on the east front of the Capitol at Washington. After a long intermission in civil life, my present commission is dated April 11, 1917. As one of the oldest men in service it is a great joy to assure these thousands of younger men—and God bless them!—that they are joining services with a goodly heritage of glorious traditions. I am sure that they will never allow them to be tarnished.

W. W. KEEN.

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FIRST, FURTHEST AND BRAVEST

In our issue of June, 1917, we called attention to the fact that the Medical Department was already first at the front; anticipating that more belated branches of the service might later lay an unwarranted claim to such enviable priority, as proved to be the case. We showed that large numbers of medical officers, enlisted men of the Medical Department and nurses were serving with the English and French in Belgium and France long before there were any other American troops on foreign soil; and that they suffered the first wounds, and achieved the sad distinction of the first deaths, at the hands of the enemy. Our exposition of fact has just been confirmed officially by the Secretary of War, who, in his Report for 1917, says: "Indeed, the honor of first participation by Americans in this war belongs to the Medical Department."

Since then the record of the Medical Department has continued its priority of glory. It has its representation in Italy, and through its ambulance service it is the only branch of the Army flying the American flag on the battle lines of Macedonia. In its latest extension of its humanitarian frontier, a hundred medical officers are en route to Roumania for service.

Now comes the announcement that France has honored Ambulance Section No. 5, on duty with the French forces, with the first decoration for valor given any American military organization, the "fourragere." This rarely bestowed decoration, an aiguillette with a cord of the colors of the Croix du Guerre, is worn by all members of an organization twice cited in orders for extraordinary heroism.

The medical profession may well take pride in the fact that its representatives on the firing line have gone first, gone furthest, and been adjudged the bravest.

E. L. M.

"SMARTNESS"

Smartness is defined as the quality of being able to accomplish results quickly and efficiently; it has a peculiarly appropriate application to things military and especially to military personnel. A distinguished British officer recently defined it as the outward and visible sign of efficiency and illustrated his definition by the story of two regiments. One slouchy, unkempt, slow in executing orders, ill in drill and poor in marching; as he expressed it, "a rotten organization." The first tour of this regiment in the trenches resulted in its annihilation and serious danger to the whole line. The other regiment was "braced" to the limit, clean in person, dress and arms, quick to respond to every

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order and on the *qui vive* for anything; the men were proud of themselves, proud of their organization and the army was proud of them. In its very first engagement, this regiment covered itself with glory and received the well-merited approbation of its fellows.

Just exactly what was the difference between these two regiments? What made one an honor to its country and the other a disgrace? That indescribable something which is called "Smartness."

The British officer, continuing his story, said: "In the beginnings of our national army it was thought that inconspicuosity was essential so we used dull trimmings and when, by chance, they were not dull, allowed them to become so with dirt. Dirty trimmings begat dirty shoes, dirty shoes dirty clothing and dirty clothing a dirty person. A soldier in this condition could not respect himself and one who does not respect himself can respect no body or thing."

The result was demoralization and the authorities perceived that by allowing departure from a "smart" appearance they distinctly threatened the efficiency of their army.

This, if we would but realize it, is an experience common to all walks of life. No one respects a tramp. Why? Because the tramp does not respect himself, how could he? So soon as he begins to respect himself, his value as a citizen increases and in due time he comes to respect the state.

"Smartness" is a quality particularly important to cultivate in the sanitary soldier. Our organization is necessarily a somewhat loose one, the character of its work demanding more or less independence on the part of the individual. For this reason alone it is essential that our discipline should be of the highest quality. The carrying of a rifle or the trundling of a gun is not the only essential to the making of a soldier. The carrying of a litter, in its way, is as important and demands of its bearer an intelligence, resourcefulness and courage quite equal to that of the arms bearer. It also demands a discipline of the strictest character.

In these days of great hospitals, requiring an immense personnel, the profession has developed a cast of hospital physicians that has learned the necessity for team play and consequent discipline. Many of this class are now in the service and fortunate it is for the army that they are; for through them the medical department will get the moral support necessary to the maintenance of the quality and training of its enlisted personnel.

We sometimes wonder just what this training now is. Is it uniform, "smart," rigid but not absolutely unbending? Is it just, though reasonably generous? Is it efficient?

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The necessity for absolute uniformity of training admits of no argument. The Prussian army which, whatever its shortcomings, is accepted as the standard in military efficiency, insists upon uniformity to the ultimate degree. It does not demand geniuses, but a high average mediocrity and such training that, in any contingency, the problem would be solved practically in the same way by every officer and man, and so the result could be anticipated by all.

The advantages are obvious and, even now, we are sending detachments of line officers and men to the front to learn the game as it is taught there, so that when their organizations arrive on the ground they, in turn, can be taught. We have not, however, heard that any officers or men of sanitary troops are being sent for this purpose, though such there may be.

We have many thousands of sanitary soldiers scattered among our various camps; are we really making soldiers of them? Are they "smart" and well disciplined? Are their military appearance and manners unexceptionable? Are their equipment, transport, etc., kept up to the best field artillery standards, for example? Or do their ambulances run about covered with mud, tail boards down, dirty and disarranged inside, curtains flapping, animals ungroomed and harness awry, drivers and orderlies lolling about, smoking and looking anything but the soldiers they should? Do our officers insist upon attendance at roll call and drill of every possible man in their organization? Is the prescribed system of instruction carried out rigorously, or is "recall" sounded when the barest excuse offers? And finally, do the intelligent line officers of the camp acknowledge that the sanitary units are model military organizations? We have known such to happen in the old army, not too often to be sure, but no doubt it is happening much more frequently in our army of today.

Let us hope so, for if our officers and men are not disciplined and uniformly trained, if our organization is not "smart," if our hospitals are not maintained at the highest civil standards, if our ambulances and animals are not up to the best field artillery pattern, if our field hospitals cannot pitch in twenty minutes and strike in half that time, if our ambulance companies cannot break camp and get on the road in half an hour, in a word if we are not a military team, we are, by so much, lacking in efficiency and failing in our duty.

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COMMENT AND CRITICISM

NEW USES FOR THE ARMY LITTER

The military hand litter, familiarly called "stretcher," is one of the most essential field appliances of the Medical Department. Its form is fixed by its uses and is only modified in non-essentials. That of our Army is among the best of its kind, combining lightness (22 pounds), strength, efficiency, and is complete in itself—a prerequisite in a field appliance. Anything that has separable parts is sure to lack some necessary part when most needed, for in the field it is easy to lose and hard to find, while replacement is often impossible.

It needs no argument to convince that the ideal hand litter is one that would meet every condition of service, so that the patient, after once being loaded upon it, would not necessarily have to leave it until finally transferred to a bed in a permanent hospital or even then. It follows from this that an army should have but one standard model of stretcher, and that all the instruction in bearer work with it should be based upon this model—exactly the same as is the Manual of Arms based upon one model of rifle.

To be sure no appliance can be universal. Circumstances will occasionally arise which will preclude the use of the standard litter, just as they will the use of the standard rifle, but this is no argument against the principle of standardization—and the rare exception only proves that there is a rule.

Maj. H. R. Allen, M. R. C., Director of the Camp Greenleaf School of Applied Surgical Mechanics, has worked out in an ingenious way the use of the regulation hand litter as a splint to meet, effectually on the field, all the indications for the treatment of any fracture, but especially of the extremities. We take pleasure in inviting attention to his modest exposition of his method and to the illustrations which so well show its technique.—*The Editor.*

"Among the numerous innovations at Camp Greenleaf there is one that will contribute both comfort and surgical aid to each of the million and more wounded soldiers every year, whose wounds are so serious that they must be transported upon a litter. This innovation costs nothing since it neither adds to nor subtracts from the army litter as it stands today and has stood for many years. Loading the stretcher requires but one man. It is literally a one-man job, and he can crawl out on his belly to his patient and load him on the litter, exposing himself to the minimum of fire. It is obviously true that, ordinarily, two men are necessary to carry the loaded litter. It may be transported back

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at any opportune time, but it must be remembered that the patient is comfortably immobilized and is actually under treatment although left alone out on the field. The soldier is loaded on the stretcher by first tieing the foot on the injured side to the front end of the litter with the litter sling. The sling from the rear end of the litter is passed over the shoulder down behind the soldier's back and is brought up between his thighs. Then the soldier's belt is used to elongate the rear sling by passing it through the handle loop and buckling it around the rear handle of the litter. It is buckled just tight enough to make the pelvis tilt up on the sling side, as far as its anatomical range will permit. The patient and the litter together are gently turned until the loaded litter rests on its feet right side up, and the patient upon it, comfortably immobilized, is actually under treatment, so far as injuries to the legs or thighs are concerned.

"Immobilization by the use of fixation forces for fixation purposes is the platform upon which all successful fracture work rests. It should be noted that the patient is loaded without being unduly handled or carried to the litter and no splints are required, no grass, or weeds, or sticks are used, nor is one crooked leg tied to another crooked leg as a substitute for a splint. There are many splinted patients in hospitals today who would do infinitely better if treated on an army stretcher, made up like a bed, with an 8-inch hole cut through the canvas for daily bed-pan service. This 8-inch hole for bed-pan service eliminates the excruciating pain endured by the patient every time he is lifted on the bed pan. By this method the patient and the litter are one and his injuries are not disturbed in any way by lifting on the litter to put the bed pan in place and remove it.

"Fractures or shell wounds of the arms, forearms, legs, thighs, trunk, neck or head are immobilized and transported by the employment of suitable fixation forces for fixation purposes. Pads under the points of attachment and possible pressure are readily applied as indicated.

"Pain from fractures is chiefly due to the prodding of soft, sensitive tissues by sharp jagged bone fragments; but if the bones are pulled down to their normal positions and fixed there by fixation forces, then there can be no prodding. By this means the chief element in the production of pain is instantly eliminated. In this connection there is another feature that is even more important than the elimination of pain, and that is the elimination of the possibility of additional damage due to the prodding ends of the bones grinding against each other, or lacerating the soft tissues. Lacerated tissues (hard or soft) are known to be excellent incubators for serious infections.

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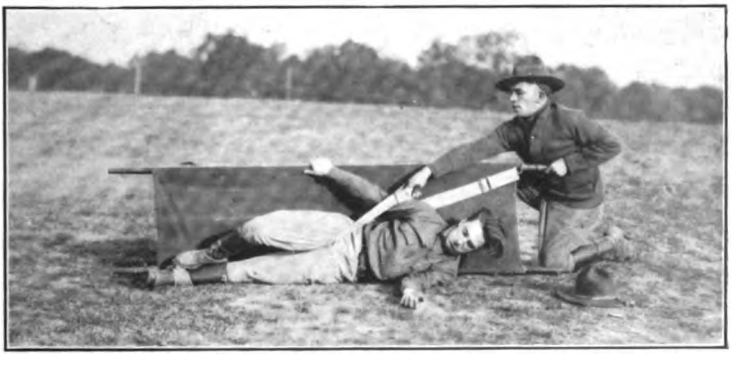
TYING THE FOOT OF THE INJURED SIDE WITH THE LEFT FRONT LITTER SLING.
Patient and litter turned on left side.

PASSING RIGHT REAR SLING IN FRONT OF RIGHT SHOULDER, DOWN BACK OF THE PELVIS AND FORWARD THROUGH CROTCH.



TILTING PELVIS BY TRACTION ON REAR SLING.

(To face page 74.)

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TURNING LITTER TO THE "LOWER" WITH PATIENT ON IT.

THE LITTER "LOADED."

REMOVING PATIENT'S WAIST BELT.

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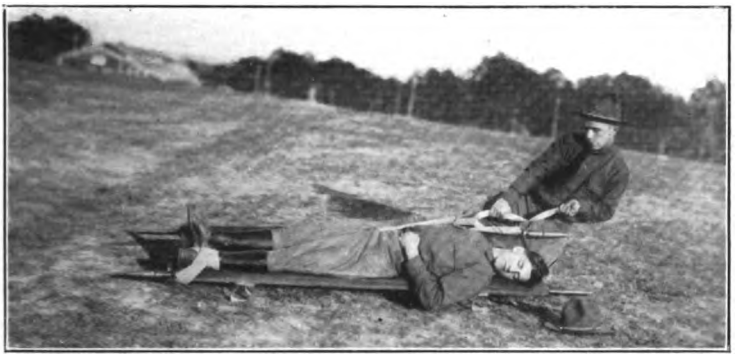

THE REAR SLING ELONGATED BY THE WAIST BELT, WHICH IS PASSED THROUGH LOOP OF SLING AND BUCKLED AROUND THE REAR HANDLE OF THE LITTER ON UNINJURED SIDE.

TILTING LITTER TO LEFT TO ILLUSTRATE EFFICIENCY OF IMMOBILIZATION OF PATIENT.

TILTING LITTER TO RIGHT.

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Litter Approaching Vertical, Head of Patient Up.

Litter Approaching Vertical, Feet of Patient Up.

One Bearer Carrying Loaded Litter on His Back. Patient Completely Immobilized.

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LOADED LITTER TURNED BOTTOM UP, IMMOBILIZATION MAINTAINED.

LITTER PASSING VERTICAL, FEET OF PATIENT UP.

PATIENT COMPLETELY INVERTED, THE FRACTURES REMAINING IMMOBILIZED.

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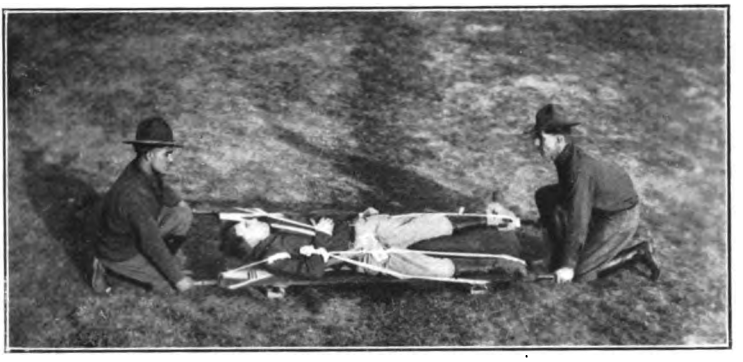

FRACTURES OF RIGHT ARM AND THIGH, LEFT FOREARM AND LEG.

COMPLETE IMMOBILIZATION, ALL EXTREMITIES BROKEN.

IMMOBILIZATION MAINTAINED EVEN THOUGH LITTER BE CARRIED BY HANDLES OF ONE SIDE.

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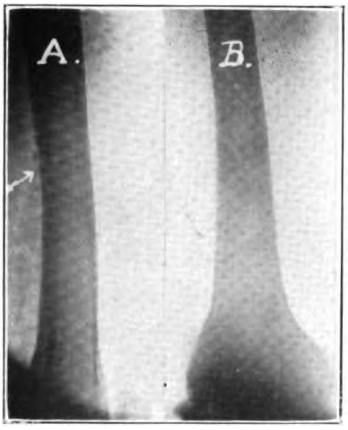

EFFICIENCY OF THE METHOD AS SHOWN BY X-RAY, AFTER TRANSPORTING PATIENT OVER 50 MILES IN AN AMBULANCE.

EIGHT-INCH APERTURE IN CANVAS FOR BED-PAN SERVICE.

TWO MEN IMMOBILIZED ON THE SAME LITTER.

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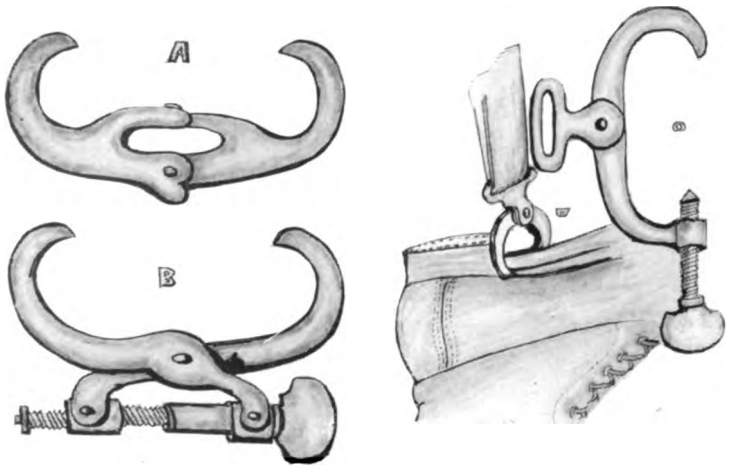

DIFFERENT TYPES OF ALLEN'S SHOE CLEATS.

DEMONSTRATING THE EFFICIENCY OF THE ALLEN SHOE CLEAT, AS WELL AS OF THE ARMY SHOE AND BELT.

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"That these fixation forces produce effective immobilization may be inferred from the accompanying illustrations, and proved by asking a patient so treated. But if one really wants to know what a straight jacket actually feels like, then have some one immobolize him on a litter by the Allen method. I have tried it myself and have observed two very interesting results. First immobilization is certainly present in very large quantities, and second, the complete absence from pain or discomfort is surprising. The reason for the absence of pain is the absence of traction. Traction is not constant; it is only present when the litter is markedly tilted or when the muscles contract, but since the muscle contractions are blocked by adequated fixation forces, they are deprived of their normal attribute of producing motion. The explanation is simple enough when you stop to think about it.

"The patient can be carried with either end of the litter raised, making it possible to remove wounded soldiers out of deep dugouts, or transport them around the sharp, narrow angles of the trenches.

"All of this can be done without altering the army litter, but if a soldier has both arms and legs fractured, or is badly torn by shell fragments, or crazed by poison gases or other causes, then additional dressings and retention straps would be required. With little expense these padded straps and sole cleats, and the 8-inch hole in the canvas, can be supplied making the U. S. litter a universal instrument for loading, transporting and treating wounded soldiers.

"As an apparatus for hospital treatment it is only fair to say that its hospital record is in no sense inferior to its qualities as a means of transportation. The limited allotment of space prevents narrating the great variety of cases more appropriate to litter treatment than to any other single device. The many appliances now in use can be employed better with the stretcher than without it but that opens up another chapter much more elaborate than that already presented."

DISPOSAL OF EXCRETA IN THE TRENCHES

Our veteran colleague, Dr. Simon Baruch, sanitary soldier and civil hygienist, a lover of humanity whom "age cannot wither or custom stale his infinite variety," has honored THE MILITARY SURGEON with some suggestions regarding disposal of excreta under the peculiar conditions of warfare on the western front, which we take pleasure in presenting.

Life in the trenches is primitive and there, perhaps, men come closer to nature than anywhere—they are literally cave-dwellers. Moreover, in their simple life they are actually demonstrating every minute the struggle for existence and the survival of the fittest.

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To help our side to survive we would give the best possible of our brains, experience and substance, a best which will be the outcome of the combined effort of the nation and to which our colleague would contribute whole-heartedly.

The matter of trench conservancy, in its last analysis, seems quite simple, a bucket, a man to carry it and a convenient place to empty it. But there is hardly anything more important to the health of the command than this very matter. Shall our trench dweller sit or squat over the bucket? If he sits he becomes a host to lice, if he squats he takes the posture nature indicates, and avoids infection. What form shall the bucket take and the seat, how many will be necessary, and where shall we get them? Should the urine as well as feces, be removed from the trenches? Shall deodorants be used—flies excluded, etc.? What about toilet paper and clean hands, are these possible?

Dr. Baruch submits and defends the following propositions supporting his plan of disposal:

1. That separation of the liquid from the solid excreta may be easily accomplished without resorting to the unnatural procedure now practiced.

2. That for the practically dry solid excreta deodorization before removal from the bomb-proof is sufficient for all practical purposes.

3. That no bulky deodorant or disinfectant should be added, because—

4. The capacity of the can or bucket should be utilized to the utmost to save time, labor, and exposure to the enemy's fire.

5. Any large tins at hand may be used in lieu of buckets, and

6. The boxes and seats here designed may be shipped in "knock-down" form, and the buckets in nests. They appear to me as important as other supplies.

"The disposal of excreta in the trenches has been briefly but clearly described in Colonel McCulloch's article in the *Journal of the American Medical Association*, July 14 and 21, 1917. It is again referred to in the October number of THE MILITARY SURGEON by Col. Thomas H. Goodwin, of the Royal British Medical Service. I have published a brief article on the subject in the first named journal. Since the latter was written I have had a personal interview with Captain Gilmour, of the British Royal Medical Service, in the Surgeon General's office, who confirms the correctness of the subjoined diagram (Fig. 1).

"Taking these views and descriptions as a basis I would discuss the following points.

"1. In the bomb-proof shown in the diagram two urine soakage pits are placed alternately with two buckets.

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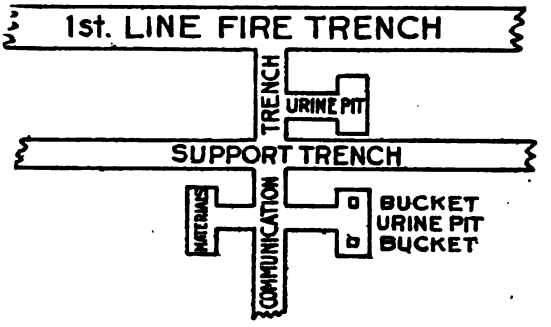
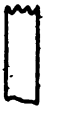
"2. It is expected that the urine be passed into a separate bucket or into a trough leading into the urine soakage pit before defecation.

"3. That the bucket (of about 8 gallons capacity) is removed when two-thirds full, about one-fourth of the contents being cresol solution and sawdust, replaced by another and then taken by hand to the disposal pits in rear of the trenches. In the diagram this distance is about 1,200 yards.





DEEP TRENCH LATRINE

DEEP TRENCH LATRINE

SANITARY ARRANGEMENTS IN THE TRENCHES.
Fig. 1.

"4. That the bucket when so removed remains covered with the wooden seat and cover (Fig. 2).

"5. That the bucket is thoroughly cleaned and washed before it is returned to the bomb-proof.

"I have devised the following described bucket to be used in lieu of urination into a separate bucket, prior to defecation.[1] The bucket,

[1] *Journal of the American Medical Association*, November 17, 1917.

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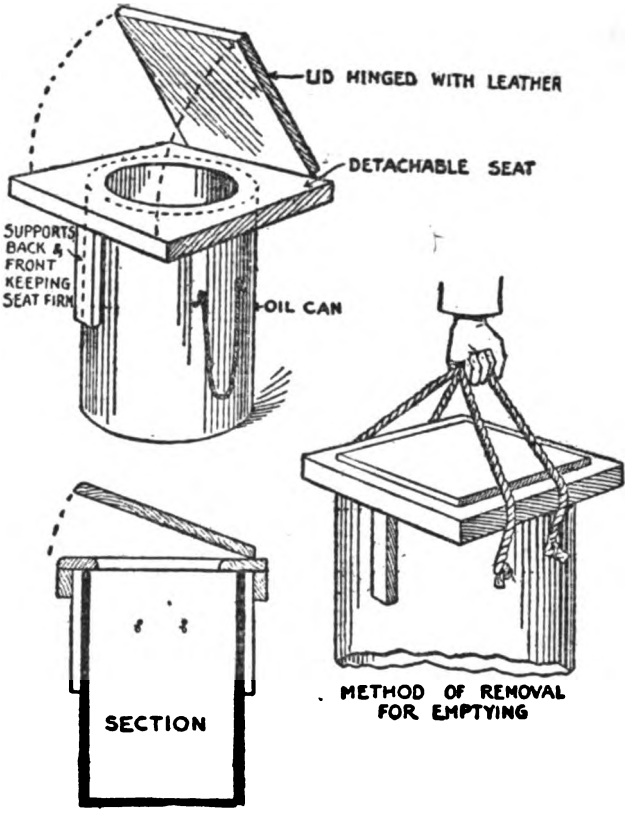
12½ inches deep and 13 inches in diameter, of about 6½ gallons capacity, is made entirely of metal and provided with a seat of the usual style with a self-closing lid (Fig. 3). The diagram shows that the solid excreta are received in a separate smaller bucket which is hinged in a groove cut in the upper posterior rim of the outer bucket. This arrange-



IMPROVISED LATRINE BUCKET.
Fig. 2.

ment provides for the reception of 40 pounds of liquid and 8 pounds of solid excreta. Only 14 individuals could be accommodated with this arrangement, which is intended for temporary use during the rapid construction of the trenches. Doubtless, the Sanitary Corps would arrange for these buckets when cooperating with the trench builders.

"With reference to the second proposition; this is an unnatural procedure that results in incomplete emptying of the bladder. Consequently, more urine is passed during defecation. When the trench

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is being supplied with the urine soakage pit described in Colonel McCulloch's (Fig. 1), I would suggest enlarging the pit *A* and placing the buckets as indicated in Fig. 1.

"In order that the individual be enabled to direct the urine into the pit during defecation, I have devised the bucket (Fig. 4), which is provided with a septum about 3 inches from its anterior wall, beginning 4 inches below the seat and terminating in a 1½ inch tube. A soldered coarse wire sieve below the upper rim would prevent paper, etc., from entering the funnel. The tube is intended to be inserted into a larger tube projecting from the urine soakage pit, as is shown in Fig. 4. This bucket will serve nearly 100 men without renewal. For removal, the entire bucket is taken to the disposal pit.

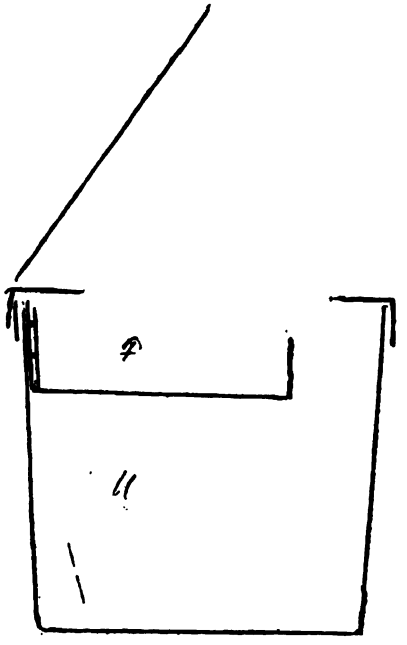

FIG. 3.

"As to the third and fourth proposition, as now used, this device would provide for only about 50 men because the bucket is removed when two-thirds full. If the feces were more dry and other fly-protection provided the bucket would contain more dejecta and less deodorant, making it unnecessary to carry by hand to the disposal pit a partly filled bucket, together with the wooden fly-proof seat. I suggest in view of the fact that the excreta in my device will be less fluid, that the size of the bucket be reduced one-quarter. An ordinary metal cover, similar to that of a garbage can, would afford protection against flies and

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would certainly be more easily cleaned. The advantage is obvious, as is also an iron handle to take the place of the rope. The bucket is about 13 inches in diameter and 12½ inches deep, with a capacity of 6½ gallons.

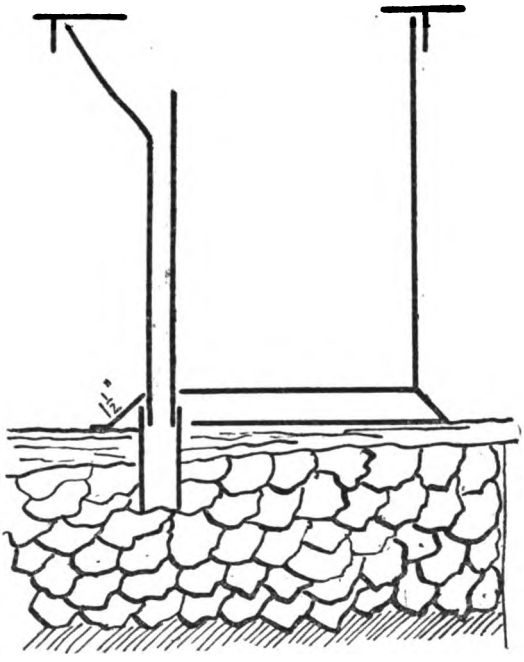

FIG. 4.

"When the trench is more permanently established the following device may prove of practical value: A separate urinal is constructed

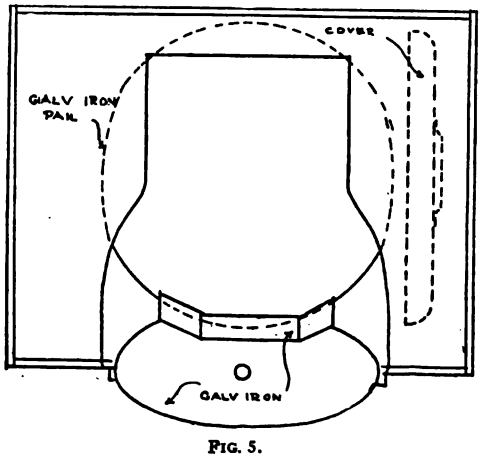

FIG. 5.

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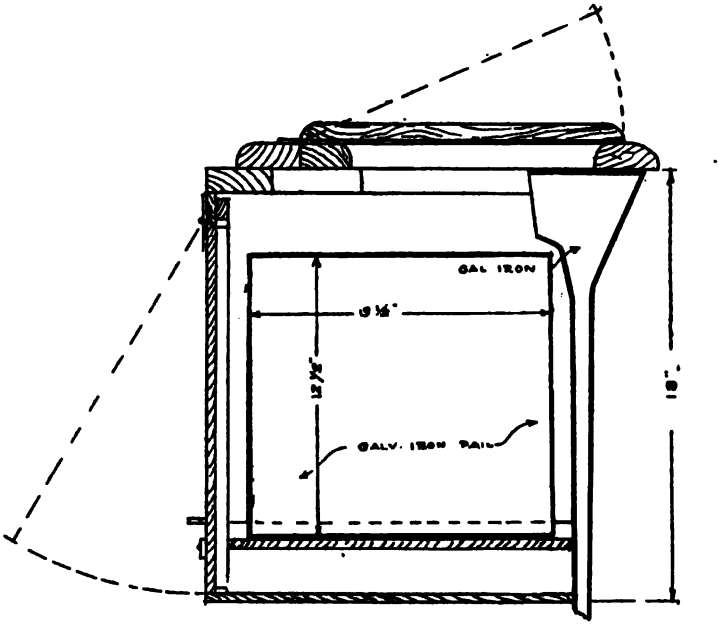
(Fig. 5) and secured to a fly-proof box with seat and self-closing cover. Beginning at a distance of 4 inches below the seat on the posterior wall, the urinal is supplied with a flange of 1 inch, which is turned backward and upwards at a slight angle. A strong wire is hooked securely to this flange, and fastened posteriorly to the lowest point of the upper portion of the box for the purpose of diverting excreta from the center, where they are apt to accumulate in a pyramid. A bucket of a capacity of 6½ gallons is snugly placed against the posterior wall of the urinal, beneath the flange, and held in position by strips of wood on the floor of the box. A door, 15 inches high, occupying the entire width of the box, is secured by hinges to the upper part of the posterior wall of the



box, and is provided with a cleat 2 inches above its lower edge on the inside, so that when it is closed these cleats hold the bucket in position. A handle for lifting the door and knobs for securing it closed are provided. The iron cover is placed alongside the bucket within the box, before closure. As shown in Fig. 5, when the seat is properly adapted, the urine cannot be directed into the bucket except by wilful design. In this manner solid excreta are received in the bucket, while the liquid flows into the urine soakage pit.

"This bucket is an ordinary 6½-gallon garbage pail, which, differing from the garbage can, may be 'nested' for transportation. For removal the posterior self-closing door is lifted, the cover is slipped over

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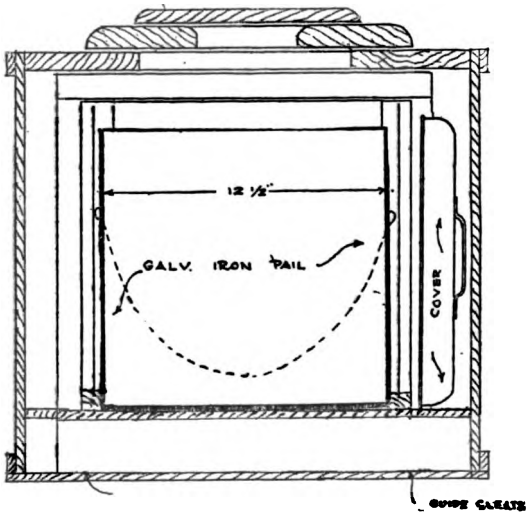
the bucket, and a fresh bucket is inserted in its stead. The full bucket is now carried to the disposal pit, emptied and cleaned.

"The advantage of this plan is that it would have a much larger capacity than that above described. The seat may be of wood, but it could be readily constructed of galvanized iron. Objection has been made that the iron seat would be cold. Since the larger front portion of the seat may be covered by the trousers, it would appear that this inconvenience would be infinitesimal when compared to the others our soldiers have to suffer. The iron seat and cover would not weigh more than a good hard wood cover.

"The solid excreta average 4½ ounces daily. The bucket here figured would easily receive 40 pounds of solid excreta, which is as much as a strong man may conveniently carry for a distance. This arrangement would, therefore, provide accommodation for about one hundred and fifty men, if no urine or other liquid is added.



"Disinfection would, it seems, be most effectively practiced at the disposal pit, thus saving the carriage to and fro of the disinfectant. It remains, therefore, chiefly to provide against flies and odor. The latter may be accomplished by the old-fashioned nursery process of smoking paper whenever the odor becomes annoying to men whose olfactories have become inured to naphthalene, sulphur, iodoform, etc. Contamination of flies would perhaps be best avoided by care in handling the bucket and by sprinkling with cresol solution, which Colonel Goodwin, R. A. M. C. informs me is his practice.

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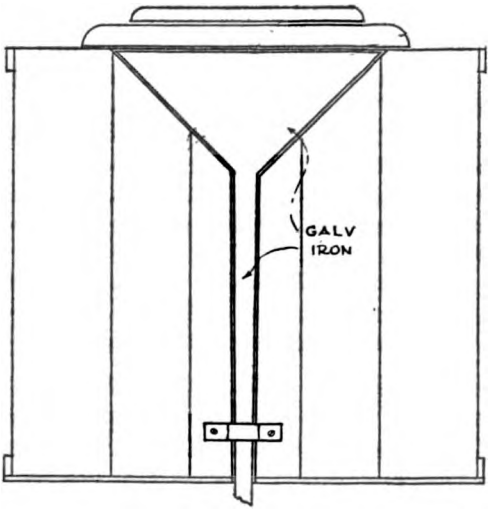
"The object of my device is to obtain accommodation for the largest number possible, to avoid the necessity for frequently carrying the bucket by hand for long distances, and for frequent exposure to the enemy's fire part of the way. For this reason I venture to suggest the omission of bulky disinfectants and deodorants. Pulverized copperas, chloride of lime, and others will naturally present themselves as cheap, easily applied, and efficient. Among the advantages of the iron seat and cover is its indestructibility. Captain Gilmour, of the Royal British Medical Service, has informed me that the men are often forced to use the wooden boxes for fuel in very cold weather.



"It occurs to me that the unpleasant and unwholesome cleaning of the buckets after being emptied could be greatly improved by using paper containers. I have experimented with the latter, and have found the ice cream paper bucket to hold water for 14 hours, but it is clumsy because made of one piece, and is not round. I believe that a cheap stiff paper tube 12¼ inches deep, and of the same diameter, snugly fitted to the inside of the bucket, and a cardboard bottom would suffice to prevent adhesion of excreta to the sides of the bucket. The bottom may be placed in first. On one side of the box there is provision for storing such paper linings when properly packed. Their use would be compensated a thousand fold by saving wear of the bucket and time and labor. As the British method provides toilet paper and our own regulations require its use, my suggestion may not be regarded as unwarranted for the rough usage of trench sanitation, indeed for

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camps also that are not provided with sewers, these devices appear to be well adapted. The latrine could be arranged over long urine soakage pits. The buckets or boxes receiving solid excreta could be supplied with stiff paper lining, and they could be quickly conveyed on wagons to the disposal pit or incinerators, and returned clean."

THE ARMY METHOD OF VACCINATION

For many years Army regulations have prescribed in detail exactly how the operation of vaccination shall be done, and this method has varied but little. The principle of multiple incisions is insisted upon, at least two being required. After detailing the manner of preparing the skin, the essential of which is washing with warm water followed by alcohol, the regulation proceeds:

Incision is the method of choice and it should be made with the point of a sterile needle, producing a "scratch." A sterile scalpel may be used, but is more likely to cause bleeding. The incision or scratch should preferably not draw blood. There should be at least two incisions, three-quarters of an inch long and one inch apart; after exposure to smallpox four incisions will be made. The virus is then placed upon the abraded surface and gently rubbed in, unnecessary irritation being avoided.

The wound is allowed to dry thoroughly and can be left without dressing, though several layers of gauze may be applied with adhesive plaster. Any dressing that retains heat and moisture is bad. Shields will no longer be issued.

Capt. E. L. DeLanney, M. R. C., has prepared for THE MILITARY SURGEON a very timely article in which he reports the results in 520 cases vaccinated by the endermic method. His review follows.—*Editor.*

"I have maintained for a number of years that the American method of vaccination was defective in its technique because of the variety of local results, some of which are very severe. Nor could they all be due to individual susceptibility, because bad arms often occurred in those previously vaccinated, neither could they be blamed to the operator because, no matter how careful he was, bad arms were sure to follow. Shields and protectors were often to blame, but bad arms would occur where nothing in the way of protection had been used. What, then, was the cause of those large, sloughing, painful sores with their necrotic cores and sharply defined edges, which later filled up with redundant granulation and still later became glazed over, instead of covered with normal epthelium?

"During a smallpox epidemic, I had, as city physician to an industrial city, to have about 4,000 laborers vaccinated. The best virus procurable was used and the strictest precaution was practiced, but, in spite of all, a large number of very sore arms developed, with

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resultant suffering and loss of time to laboring men who could least afford it.

"It was noticed that a large number of men of foreign birth had well-formed scars on their arms, and it was learned from them that they nearly all had been vaccinated from scabs removed from another person's arm, as is still the practice in some communities. It was also noticed that when 'scab vaccination' had been used, a larger number of places on the arms had been vaccinated, often as many as five or six to each arm. The question then came up: Does not the number of vaccination incisions play an important part in determining the severity of the local reaction? Following these observations I then proceeded to experiment with multiple vaccination, but the epidemic having been controlled and nearly every one being vaccinated, no large number of unvaccinated could be gotten together for vaccination, observation and tabulation of results; but from the few that we were able to observe it seemed that the reaction was very much less severe, and that fewer sore arms resulted from the multiple vaccination than in the single ones.

"During the mobilization of the National Guard in 1916, I tried again to confirm what had then become a conviction, but the hurry, incident to rapid mobilization, did not permit of statistical report.

"In the February 10, 1917, *British Medical Journal*, Capt. H. W. Hill, D. P. H., described a method of vaccination by the subdermal method, and an opportunity to try it out came when 520 truck company personnel came to Fort Crook, to be equipped and prepared for overseas service. I then had an opportunity to try out the speed with which this method could be used, an essential point when a large number has to be vaccinated, also the percentage of primary and secondary 'takes' and the results, both local and systemic. These results are tabulated below, and justified statistically our previous conviction, that multiple affords far less local reaction than single vaccination and that the defusion of the area of inflammatory reaction prevents local death of tissue.

No. of men vaccinated	Not previously vaccinated	Previously vaccinated
508	116	387
Successful	99	109
Unsuccessful	17	278
Had smallpox	3	2
Successful, per cent	85	28
Unsuccessful, per cent	15	72
No. of dressings required	1	0

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"The time actually consumed in vaccinating each man was about fifteen seconds, there was no time lost in waiting for arms to dry, no after treatment and in no case was any man excused from duty for more than three days. The method was practically that described by Hill, which I here copy:

"(1) The sleeve is rolled up. (2) Orderly 1 washes the arm with soap and water. (3) Orderly 2 washes the arm with rectified spirit. (4) Orderly 3 washes the arm with ether. (5) Orderly 4 breaks the capillary tube of glycerinized vaccine, and sets the rubber bulb or other method of expelling contents, handing it to orderly 5. (6) Orderly 5 expels the vaccine at three or four points on the arm in a triangle or square having not less than 2 inches between the points. (7) Orderly 6 sterilizes an ordinary sewing needle, and hands it to the medical officer. (8) Medical officer punctures the arm through the drops of vaccine; six tiny punctures, drawing no blood, are made through each drop, each set of six occupying a space of not more than 1/6-inch square; the needle is held almost parallel to the surface; not over 1/1000 of an inch enters the epithelial layer, a peculiar little 'snick' being felt as the needle goes in. (9) Orderly 7 wipes the vaccine. (10) The sleeve is pulled down."

"The only difference in the technique I used was, that all the needles were mounted on a handle, either a hemostat or pushed into penholders, to facilitate handling. This was found a great help, for when the needle was held in the fingers alone they became very tired, and the needle hard to hold.

"Of the 508 men vaccinated not one had a bad arm. There was redness, and swelling differing in degree with each case, but no suppuration or large scabs or large area of necrosis. One case had to be dressed once because of multipustular vaccinia around the points of vaccination. These pustules resembled confluent smallpox, and covered the outer surface of about half the arm, but they soon dried without bad results. In previously vaccinated cases a typical local reaction resembling a von Pirquet reaction appeared at the side of puncture, usually accompanied by itching which subsided in a few hours; this was not an indication that the vaccination was or was not going to 'take.'

"That which is hard to explain is the great variation in the number of successful points of vaccination in different arms; in some cases all four took, in others three, two or one—this in both primary and secondary cases. It was noticed, however, that the relative number increased in the unvaccinated, while in those with only one 'take' it was always a very weak 'pock,' with very little systemic reaction as though the individual had a relative high degree of immunity.

"The vaccinial 'pocks' were typically umbilicated, and dried up in 15 to 20 days in the form of hard black buttons, which readily dropped

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off, leaving a typically vaccinial scar. The accompanying photographs taken on the tenth day after vaccination, when the arms were checked up for results, shows the different types of 'takes.'

"It would seem from observation of this series that the method described by Hill has many advantages: (1) it protects the arm from external infection, for as soon as the arm is wiped off the punctures are practically sealed; this also obviates the necessity of waiting for the arm to dry or to be dressed. (2) The numerous vaccination points diffuse the area of inflammation over a large surface, thus preventing the formation of a necrotic center, as in the single method, at the same time increasing the percentage of 'takes.' (3) It is painless and bloodless. (4) It is rapid enough for any requirement. The saving in suffering, time, bandages, and dressing by this method will be appreciated by those who have had an opportunity to compare this with other methods now used, or who have had to spend whole mornings dressing suppurating arms."

CONSERVATION OF GREASE

No part of the many functions of the company commander is more important than the intelligent supervision of the company mess. It is an axiom among soldiers who know, that a well-fed and a well-worked company is a happy, efficient organization. If the men are overfed and underworked they suffer from repletion; if overworked and underfed, from depletion; both conditions promote inefficiency. This statement can be verified in any regiment, the best companies of which are inevitably those in which the training and feeding are intelligently balanced.

But a company mess does not run itself, nor does the cook or even the mess-sergeant determine its character; it is the company commander, and the value of the mess will be directly proportionate to his interest in it. We hope that the boards now investigating the efficiency of officers will give some regard to this question from the standpoint of the company mess.

Apropos to kitchen economy, First Lieut. George E. Barksdale, M.R.C., U. S. A., has favored THE MILITARY SURGEON with his views regarding the conservation of fats by military organizations, which conservation is important from several angles. He writes:

Soon after my assignment to duty at ——— as sanitary inspector of the ——— camps, I was forcibly impressed by the waste that was noticeable in camp and barracks kitchens, and the apparently inexcusable way in which not only meats but fats, bread and vegetables were thrown into garbage cans to become a burden in the way of disposal and, even if sold, to bring to the company

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fund a mere fraction of what the material cost or was actually worth as food or soap.

I realize it is no easy or grateful task to attempt to teach the average civilian or rookie cook even the fundamental principles of kitchen economy; still if we hold aloof from approaching a disagreeable duty, because it appears to be merely a more or less immaterial detail, the waste will continue and much good food will be lost. Even rejected fats profit no one under present conditions.

Upon inquiry at one of the mess kitchens, I found that three pounds of soap daily per hundred men are used for dishwashing. This of course does not include the amount used by the men for lavatory or laundry purposes which is as much again. As the price of common soap is eight cents a pound at present, this means an outlay by an organization of one hundred men of 24 cents a day for kitchen soap. As we have over a million under arms we are, accordingly, paying $2,400 a day for soap for kitchens alone. In the meantime, the waste fat from these kitchens becomes a question of disposal and amounts to enough in a single day, in many instances, to produce sufficient soap to last the kitchens a week.

If means were adopted to save this single item of waste fats, not only would such result in disposing of one of the most annoying of all camp wastes, but would serve, as well, as a really important source of fat, which is becoming scarcer as the war progresses.

All good housewives save "drippings" for various culinary purposes and soldiers could at least make soap from the fat they now so recklessly waste. This is easy to do and the method suggested would effectually produce soap that could answer all the purposes of camp life. I am not wedded to this method, others may be equally good or even better.

Upon inquiry at one of the camp kitchens I found I could secure as much grease as I needed. This had resulted from a surplus supply of tallow and hog fat obtained from boiled or baked meats which had, in this instance, been saved.

This was mixed in the following proportions: Five pounds of strained grease, obtained by melting the grease and straining it through a coarse cloth, was added to a solution of caustic soda (common lye) made by dissolving a pound in three gallons of water, limestone water will not do. This mixture was boiled slowly for two hours, occasionally stirring with a paddle, sufficient water being added from time to time to make up for the amount lost by evaporation. Towards the end of the process, small quantities of the mixture were mixed with water to ascertain if all of the oil was combined and if the mixture readily hardened upon cooling. Should there be too much oil for proper combination or the saponifying process be not completed, globules of fat would float on the admixed water. When such is the case the process must be continued until the soap is completed. If, after a reasonable time, globules of oil still appear, a small amount of solution of lye is added to completely saponify the excess of oil or fat present.

When all the fat had saponified and the water disappeared, the finished product was poured into a suitable flat vessel and put away to cool. In twenty-four hours it became sufficiently hardened to cut into suitable pieces for con-

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venient handling and dividing. This was done by placing the soap on boards, each cake being separated about a quarter of an inch to allow air to permeate through the pile. When completely hardened it was very readily cut into bars of about a pound each, by using a dull knife.

The five pounds of grease yielded 16 pounds of soap when fresh, but it lost some of this weight in drying. The soap was ready for use the very day it was made but it is better to have it thoroughly dry before using.

In collecting the grease in camp, previous to making the soap, all meat skins, either from the mess room or kitchen, all uneaten portions of butter, oleo and fat of any kind, the scraps of meat left on plates, should be deposited in a vessel placed near the garbage can, so that the fat could be scraped into it as the man deposits his uneaten food in the garbage can. In this grease pail, which should be provided with a tight cover, is placed at least two gallons of water in which a pound of lye is dissolved. This solution slowly saponifies the grease and when the accummulated quantity is sufficient, the whole is gently heated and strained through a cloth or collander and the manufacture of soap continues. Of course a rough estimate of the amount present should be made in adding any more grease to be saponified by the lye. The object in using the lye solution is to obviate any likelihood of the grease becoming offensive by being kept. If there is an opportunity to render the fat from time to time and to discard the meat skins and other portions which cannot be used, the grease may be kept for a month or more with impunity, when it may be worked into soap in a few hours by one man.

The necessary utensils for utilizing the waste of fats as here suggested are, a six gallon boiler, a pail of four gallons to hold the fat and a common baking pan into which the finished soap may be poured to cool. The heat necessary to carry on the process may be had from the kitchen fire, the incinerator, or a camp kettle suspended over a fire.

This simple method if methodically carried out, I am quite sure will effect a very considerable saving, it will use that which is going to waste at present and at the same time lessen the amount of money the government now expends for soap, if not wholly abolishing this item of cost.

In former years few households bought soap except as a luxury, especially in the country, because the saved fat was used to make soap. Just what becomes of it at present is a question; perhaps it is thrown away or burned, wasted in a truly modern American way. We buy soap because we are not thrifty enough to make it.

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CURRENT LITERATURE

A New and Efficient Substitute for "Nutrose," by B. L. Mackenzie Wallis, Temporary Lieutenant, R. A. M. C. *The Indian Journal of Medical Research*, Vol. iv, No. 4, April, 1917, p. 786.

Wallis, in some investigations carried out with the object in view of preparing an efficient substitute for the patent German food-stuff known as "Nutrose," was able to report results appearing to be remarkably successful. The preparation made by Messrs. Meister, Lucius, Brunning & Co., in his hands yielded results contrary to those hitherto recorded as representing its composition, namely: Water, 6.8 per cent; protein, 15.9 per cent; fat, 10.3 per cent; carbohydrate, 66.0 per cent; acid, 1.0 per cent.

"Nutrose" has always been classed amongst the dry milk products. The ordinary dried milk or casein, prepared by the Protene Company, is placed on the market as "Protene Flour"; casein combined with ammonia is sold as "Eucascin"; casein with soda, as "Nutrose"; casein with potassium, as "Plasmon." "Sanose" is said to contain 80 per cent of casein and 20 per cent of egg albumen, and "Sanatogen" to consist of casein and 5 per cent of sodium glycero-phosphate.

From his chemical analyses, Wallis concluded that nutrose contained peanut flour in quantity and that this constituent was the most important factor in determining the properties of nutrose. But both casein and peanut flour are insoluable in water and this fact staggered the investigator until he discovered that the addition of but one per cent of sodium carbonate rendered both these substances soluble.

After expressing the arachis oil, and exposing the resulting cake to the air and sun for some time, the peanut meal has the following composition: Water, 9.8 per cent; protein, 44.5 per cent; fat, 9.2 per cent; carbohydrates, 23.8 per cent; fiber, 5.2 per cent; ash, 7.5 per cent.

Not only, then, was it found that this flour had a high nitrogen content but there was evidence to show that it contained an active chemical principle of the nature of a "vitamine," although the latter "defied all attempts at isolation." Wallis finally succeeded in isolating a globulin from the peanut flour which, when mixed with casein and sodium carbonate, formed a mixture which was completely soluble in water and eminently suitable for mixture with agar to make up the well-known Nasgar medium. The final compound was made up as follows: Peanut flour, 94 parts; casein, 5 parts; sodium carbonate, 1 part.

With regard to the results obtained with the media for bacteriological purposes and the isolation of the colon-typhoid group of organisms, Wallis states: "The results so obtained were compared with those with the new nutrose media. In every case the differences were most striking. Not only did the typhoid and paratyphoid colonies appear more luxuriant, but they were individually much larger, etc." Not a little of this luxuriant growth is attributed to the vitamine content of the media.

We are, however, still more interested in what Wallis says with regard to

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"The Use of the New Nutrose as a Food Stuff," on page 793: "From the analysis recorded above it seemed probable that such a highly nutritive mixture would be a valuable adjunct to various cereals in the preparation of a flour for bread making. It has long been recognized that peanut cake is a most useful food for cattle, combining, as it does, a high degree of nutriment, together with easy digestibility. It has further the advantage of cheapness, in that it is a waste product at the present time, the much more valuable arachis oil being sought for as a substitute for olive oil and for soap making."

The ingredients for the bread are: Nutrose, 10 ounces; salt, a trace; white of egg, from eight eggs.

"The whites of eggs are first beaten into a fine froth with an ordinary whisk, and the other ingredients slowly added with constant stirring. The mixture is placed in a baking tin and baked in an oven in the usual manner."

H. G. Beyer.

The Use of Aromatic Chloramine Compounds for the Sterilization of Water for Drinking Purposes, by R. L. Mackenzie Wallis, Temporary Lieutenant, R. A. M. C. *The Indian Journal of Medical Research,* Vol. iv, No. 4, April, 1917, p. 800.

It was Dakin who discovered the remarkable disinfecting powers of the chloramines and who first prepared a chloramine from the aromatic toluene, which he named "Chloramine T." It was later ascertained that the germicidal power of the chloramines was, molecule for molecule, greater than that of sodium hypochloride, and Cohen, Dakin, Daufresne and Kenyon came to the conclusion that chloramine T was the best reagent so far examined on account of its being easily made, relatively non-toxic, soluble in water and may be kept unchanged in the solid or the liquid state for a long period. These properties make chloramine T very valuable as a chemical reagent for sterilizing drinking water. Wallis found, when distilled or sterilized water was used in the experimental observations, that it was always necessary to add carbon dioxide to obtain the maximum effect of the added chloramine.

Wallis sums up the results of his observations in the following conclusions: (1) The aromatic compounds of chlorine are powerful germicidal agents when added to drinking water in small quantities. (2) Experiments with chloramine-T indicate that 0.04 gram will completely sterilize one liter of any water in ten hours, even when 10,000 organisms per cubic centimeter are present. (3) The water so treated is entirely devoid of any unpleasant taste and will remain sterile for at least four days. (4) There is evidence to show that its activity is markedly increased by the presence of organic matter in solution in the water, in fact organic matter is essential for the compound to exert its action as a disinfectant. (5) Chloramine-T possesses many advantages over bleaching powder as a chemical reagent for sterilizing water, more particularly its definite and unalterable composition, its stability in solution, non-toxicity, absence of corrosive action, and non-production of an unpleasant taste in the treated water. (6) All the results tend to demonstrate that we have in certain of the chloramines the ideal reagent for sterilizing water on a large scale.

H. G. Beyer.

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The Carrel-Dakin Method of Treating Infected Wounds, by E. G. Schlesinger, M.B., B.Sc., F.R.C.S., Eng., Temporary Surgeon, R. N. *The Journal of the Royal Naval Medical Service*, Vol. iii, No. 3, July, 1917, p. 275.

The special merit, distinguishing this paper from some others on the same subject, is to be found in the very apparent fact that the method was tried out by skilful observers and thoroughly trained hands in laboratory, operating room, and bedside work.

As is well known, the object of the method is that of obtaining a rapid sterilization of infected wounds, so that they may be closed, either completely or partially, and the patient be spared the dangers and discomforts of a prolonged suppuration. The process is supposed to be accomplished by the introduction *into all parts* of the wound, at frequent intervals, of a suitable fluid antiseptic.

The author's choice, ultimately, fell on a solution of sodium hypochlorite, of standard strength, prepared by a method devised by Dakin and Dufresne. This method aims at securing a solution containing between 0.45 and 0.5 per cent of hypochlorite and the absence of any free caustic soda. The free chlorine of every sample of chlorinated lime must, first, be standardized by titration against decinormal sodium hyposulphite, using iodine as an indicator. The necessary quantities of anhydrous sodium carbonate and sodium bicarbonate, to be added to the solution, are then accurately determined. (For the details see original.)

The solution must be brought into intimate contact *with all and every* part of the wound and *without any diminution of strength*. This is supposed to be effected by Carrel's method of introducing the fluid by a system of rubber distributing tubes, leading to *all parts* of the wound. Immobilization of the parts is considered "in no way second to the actual local treatment."

The author makes a distinction between "sterilization in a surgical and a bacteriological sense." A wound may be surgically sterile, when it can be sewn up completely without subsequent breaking down or pus formation, "although cultures are still obtained from it! The progress of treatment must be bacteriologically controlled and it is by this means that one is to judge whether sterilization is sufficiently advanced to permit of wounds being closed with safety. "The average time taken to sterilize wounds at Carrel's hospital, in a large series of cases, was from six to twelve days for wounds of the soft parts, and from twelve to thirty days for compound fractures, in cases where the treatment was begun early, and our experience confirms this." This seems to be a very fair statement of the result obtained by the method.

While the chemical sterilizing power of the hypochlorites in infected wounds must be considered as beyond any reasonable doubt and as a fact, it would still be of considerable scientific interest if a parallel series of observations could have been made with normal saline, Ringer's or Locke's fluid, so as to produce comparative results. Such a series of contrasts might, perhaps, also contribute toward confirming the author's opinion with regard to the special attributes and actions of Dakin's solution on proteins: "Dakin's solution has the valuable property of rapidly splitting protein into soluble substances, which by their

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reactions would appear to be amino-acids, and this property, which has been very little insisted on, appears to us to be perhaps the main factor in its success, and incidentally to open up the whole question of the treatment of septic wounds from a new viewpoint." Whether the result was brought about by a process of oxidation or one of hydrolysis would be immaterial, the different metabolites produced are not without some influence on either living tissues or microörganisms. This remains to be demonstrated!

H. G. Beyer.

A Simple Method for Maintaining Apposition of Divided Nerves and Tendons During Suture, by G. Letshal Cheatle, C.V.O., C.B., F.R.C.S., Temporary Surgeon General, R. N. *The Journal of the Royal Naval Medical Service,* Vol. iii, No. 3, July, 1917, p. 302.

The method is shown in the adjoining figure (Fig. 1). The first armed needle *A* is passed a diameter's length from the edge of the cut surface of one end to the corresponding point in the other; instead of completing the passage

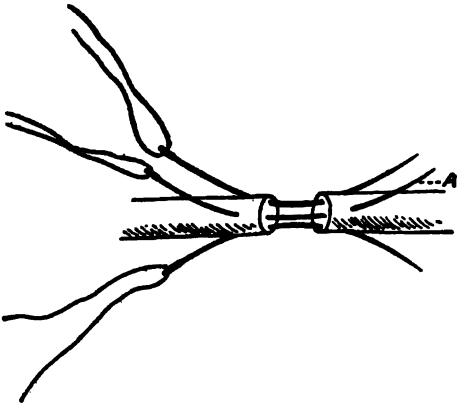

Fig. 1.—Showing the divided nerve-ends held in position by the transfixing and catgut-bearing needles.

of the needle it is left transfixing the ends and acts as a support and link by fixing the nerve-ends opposite each other. Then, at regular intervals, are passed into the nerve-ends four threaded needles, which are also left transfixing as in the case of the first needle *A*. Thus, the nerve-end being immobilized, the passage of the first needle is completed and tied in apposition; the other needles are tied in turn in the same way. When the time for the last needle has arrived, the completed sutures hold the nerve ends in sufficient apposition to allow the successful completion of the operation.

H. G. Beyer.

The Immediate Effect of Cigarette Smoking on Healthy Men and on Cases of "Soldiers' Heart," by John Tarkinson, M.D., Lond., M.R.C.P., Lond., and Hilmar Koefod, M.D., Harvard. *The Lancet,* August 18, 1917, p. 232.

In view of the well-known fact that many of our soldiers become unduly breathless on the exertion which military services entail and of the further

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equally well-recognized fact of the universality of the practice among military men of the habit of cigarette smoking, the results obtained by experiments and accurate observations are always noteworthy, especially so when they bear the stamp of a fairly scientific interpretation which is certainly the case with the work under present discussion.

The attention of the author was chiefly directed to the effect of smoking (1) on pulse, respiration and blood pressure, and (2) on reaction to exertion. This effect has been ascertained in healthy men and in soldiers unduly breathless on exertion, by instrumental methods wherever possible, and their conclusions are therefore regarded as of permanent value:

1. The immediate effect of cigarette smoking upon the circulatory system and upon the breathlessness of exertion was observed in 30 smokers, of whom 20 were cases of "soldier's heart" and 10 were healthy soldiers. Each subject smoked either four or five cigarettes during a period of 40 minutes.

2. A demonstrable effect was recorded in 17 of the 20 patients; the 3 unaffected were non-inhalers. Nine of the ten controls, all inhalers, were influenced in the same fashion, though not to the same degree.

3. The average pulse-rate among the patients during smoking was nine beats higher than before smoking; in the healthy controls it was six higher. Initial slowing of the heart was never observed, nor any irregularity referable to smoking.

4. The rate of respiration in the patients was unaffected; in the controls it was slightly reduced.

5. The average systolic blood pressure was raised by 5–10 mm. Hg. and the diastolic by 5 mm., both in patients and controls.

6. These effects appeared within five minutes; with the first cigarette they almost reached the maximum, and this was maintained throughout the smoking period.

7. A simple exertion test was performed before smoking and repeated on its cessation. In the patients the pulse-rate maintained a higher level throughout the test *after* smoking, and half of them were more breathless both subjectively and objectively. In two patients precordial pain was induced by smoking, apart from exertion. But in the controls the pulse-rate curve during exertion was much the same after smoking as before, and breathlessness was induced in two only.

8. These observations show that, in health, the smoking of a single cigarette by an habitual smoker usually raises the pulse-rate and blood pressure perceptibly; and these effects are a little more pronounced in cases of "soldier's heart." Moreover, the smoking of a few cigarettes can render healthy men more breathless on exertion, and manifestly does so in a large proportion of these patients.

9. Excessive cigarette smoking is not the essential cause in most cases of "soldier's heart"; but, in our opinion, it is an important contributory factor in the breathlessness and precordial pain of many of them.

H. G. Beyer.

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Physiological and Antiseptic Action of Flavine, by Alexander Fleming, F.R.C.S., Temporary Lieutenant, R.A.M.C. *The Lancet,* September 1, 1917, p. 341.

To the discriminating student of present-day medical literature it cannot have escaped that the problems of preventing the occurrence of the specific infectious diseases and the more general infections, following war-wounds, are occupying today as, perhaps, never before in the whole history of medicine, the serious attention of the best medical talents of the civilized world. The modern projectile, the bomb and the shrapnel seem but clumsy imitations of the bacillus, the bacterium and the coccus, as factors in the battle for the destruction of human lives with which the whole world is at present engaged. It is always the subtle, the unseen, the secret factors in all human affairs, in peace or in war, that have proved themselves to be the toughest, most unyielding and the most implacable enemies of peaceful human existence. What wonder, then, that the most honest, the bravest, the brighest, the most truly patriotic and the most scientific among us are devoting their untiring attention to the study of the prevention or cure of the ills of which these are the direct causes.

The work of Fleming is suggestive in many directions. Aside from the scientific physiological methods employed and the definiteness of the findings, the frankness and irresistible logic with which the results are rendered are, indeed, confidence-inspiring and well worthy of emulation in these days of greed and "camouflage:" "I propose to set forth in this article the results of some experiments I have made with flavine, which show that the claims which have been made that this substance approaches the ideal antiseptic are based on fallacious experiments and that by altering the experimental conditions slightly the therapeutic coefficient can be altered to an enormous extent. I will also show that the action of flavine on living tissues (as exemplified by leucocytes) is far in excess of its lethal action on bacteria." As shown in the following summary of results, which may be accepted without hesitation, Fleming has made good:

1. Flavine strongly agglutinates human red corpuscles up to a dilution of 1 in 3,200.

2. Flavine has a strong anticoagulant effect on human blood.

3. Flavine in a concentration of 1 in 2,000 completely inhibits leucocytic emigration.

4. Flavine has a very destructive action on leucocytes, and if the action on leucocytes and bacteria be each tested for 24 hours its leucocidal action is far in excess of its bactericidal action.

5. The number of microbes on which an antiseptic has to act has a very marked effect on the "lethal concentration" of the antiseptic.

6. This alteration of the "lethal concentration" with the number of microbes varies in degree with different antiseptics, and appears to be especially marked in the case of certain aniline dyes. This factor must in all cases be taken into account in any comparison of antiseptic values.

7. When many microbes are used it requires a much greater concentration of flavine to effect sterilization than that given as the "lethal concentration" by Browning and his co-workers.

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8. In serum under certain conditions staphylococci will grow in 1 in 32,000 flavine, *B. coli* in 1 in 1,000, and *B. proteus* in 1 in 2,000.

9. Flavine 1 in 8,000 appears to aid the growth of *B. proteus*.

10. Flavine 1 in 500 is usually unable to sterilize in 24 hours an equal volume of pus from a wound.

11. Flavine injected intravenously in large doses immediately disappears from the blood, which acquires no bactericidal power, and is taken up by the tissues, which became yellow but acquire no inhibitory power on the growth of bacteria.

12. Flavine 1 in 100 injected into the pleural or peritoneal cavities loses its antiseptic power within two hours.

13. Flavine is rapidly absorbed by pus or muscle tissue.

14. The so-called "therapeutic coefficient" of flavine can be changed with slight variations of the experimental method by at least 300,000 times.

15. If the antiseptic is allowed to act on staphylococci and leucocytes alike for 24 hours and the ratio is taken of its toxicity to both of these, carbolic acid has a coefficient 10 times better than flavine when the antiseptic acts on the microbes in serum and 250 times better when the bactericidal action is estimated in pus.

Exit Flavine as the ideal antiseptic!

Wherever and whenever, during the last few decades, the medical profession has been able to report real and enduring progress in the treatment of any of the known infectious diseases, it was almost invariably due to the fact that a specific antibody against the etiological factor of that disease had somehow been produced by somebody. Up to that point and before that had been accomplished, the treatment of that disease was merely symptomatic, haphazard and empiric. Prevention of such a disease was altogether out of the question and absolutely impossible, even admitting the fact that we had, in the meantime, learned to limit its *spread* through the application of general sanitary measures, thus preventing it from assuming the epidemic form.

The physician, with his vaccines and antitoxines, was now very nearly in the fortunate position of the surgeon about to perform an operation in his perfectly equipped aseptic operating room—he could fortell the result of his treatment with scientific accuracy. It may even be said that the physician, with his specific remedies, went much further than the surgeon with this asepsis. What the surgeon accomplished by merely external cleanliness, the ultimate result of applied, preventive hygiene, the physician, with his specific antibodies, accomplished in the remotest recesses of the human organism, accessible to the circulation. *Chirurgus sanat; medicus curat.*

War-diseases and War-wounds.—The problems before the general physician and the general surgeon under war conditions are naturally much more difficult of solution than are those presented under the peaceful conditions of civil life. But, here also, we find that the parallel drawn between the physician's and the surgeon's work shows up the former in a more favorable position than that of the latter, notwithstanding the great advances in surgical technique induced directly by the astounding variety of war-wounds. This must be attributed

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to the fact that the physician, provided with specific means, was also much better prepared to meet the dangers of war-diseases than the surgeon was, with his aseptic technique, to meet the emergencies of infected war-wounds. Wherever the physician was able to proceed with specific remedies, he was successful to the point of practically eliminating the commonly known infectious diseases from the war zones; wherever these failed him, his efforts came to a sudden standstill, being thrown back on the more general methods of treatment in practice during prebacteriological days. The surgeon, on the other hand, had never been provided with nor was he prepared to treat a war wound, dirty and infected, by specific means, such a specific has, up to date, not yet been discovered, and the only resource left to the surgeon, therefore, was an attempt to extend his aseptic surface technique to the interior of the wound surfaces, throughout the entire wound cavity. In this attempt, mechanical means had to give way to solutions of chemical substances. The purely chemical method of Carrel-Dakin and the more physiological method of Sir Almroth Wright are the two best known methods that have so far been employed with the aim of rendering an infected wound, at least, surgically sterile; these have been but partially successful, stopping short of the desired aim, neither the hypochlorites nor the hypertonic salt solution possessing the biological characteristics of specific antagonists against the invading microorganisms of war wounds.

Even if we do not, without further proof, accept the statement of Sir A. Wright that the body fluids acquire, in cases of war wounds, an increased power to antagonize any and all sorts of microbes by which a wound may have become infected, his method seems to us to approach nearer to perfection than that of Carrel-Dakin in that it not only removes infectious material from the wound cavity but antagonizes pullulation of microbes, calls into activity the phagocytic action of the leucocytes and the antitryptic power of the body fluids, prevents the absorption of microbes and their toxines, thus securing possible safety from infection during a prolonged transport which most of the transportable and severely wounded have to undergo before arriving at a hospital for further treatment.

All this might, however, also, easily be accomplished by a prompt and thorough exposure of the infectious agents to the action of the hypochlorites.

In the meantime, both physicians and surgeons are condemned to a state of "watchful waiting" for more light from the much needed work of chemical and biological research.

H. G. Beyer.

Investigation into the Effects of Cold upon the Body, by Norman C. Lake, M.D., M.S., D.Sc., Lond., F.R.C.S., Eng., Temporary Captain R.A.M.C. Thesis for the degree of D.Sc., Lond. *Lancet*, October 13, 1917, p. 557.

From a series of interesting experiments with cold upon living tissues, carried out with purely physiological methods, Lake was led to the conclusions that cold, down to —6° C. brought about a state of suspended animation, in which, for considerable periods, the tissue could be preserved intact and its potential vitality maintained at the normal standard, while an exposure below —6° C., would, invariably, result in its destruction: "We again state that the effects of

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cold below and above —6° C. respectively can in no way be compared—the one is chemical, the other physical, and the difference between them is as great as that between a mixture of hydrogen and oxygen gases in a tube and the water which results from their chemical combination." For Lake, —6° C. is the critical temperature in the life of the tissues, whether these be in the isolated condition or in their normal relationship to the body; he, accordingly, would have us distinguish between *true frostbite*, occurring at temperatures below —6° C. and mere *chilling of tissues*, taking place at temperatures above —6° C.

In *true frostbite* in which, according to Lake's researches, an actual destruction of the tissues concerned must be assumed as having taken place, a rapid and abundant exudation of fluids and cells from the destroyed vessels into the surrounding tissues must follow. This exudation may be so extensive as to lead, through local pressure, to the complete cutting off of all blood supply and, consequently, to gangrene.

In the mere *chilling of the tissues*, in which these must be supposed to have retained their potential vitality and in which, therefore, the damage done is not beyond the possibility of restitution to a normal condition, the danger is to be sought in the excessive exudation which we must expect to occur as a consequence of the great rise in capillary pressure, brought about by the gradual relaxation of the arterioles, previously in a condition of extreme contraction through the cold to which the parts had been exposed: "At the start the arterioles are contracted practically to obliteration and pressure in the capillaries and veins is at a minimum. As the temperature rises the involuntary muscle fibers (in the arterioles—Rev.) become relaxed and for the time paralyzed. An enormous dilatation of the arterioles, therefore, ensues and the full arterial pressure is transmitted to the capillaries. Whether the endothelial walls of these be damaged or no, the rise of pressure is so great as to cause the fluid contents of blood to filter through the walls in exactly the same manner as serum passes through a porcelain filter, when the pressure is sufficiently raised."

This pressure is still further increased by that exerted by the exudation on the veins immediately adjoining the capillaries and this, again, would explain the danger to be feared from constricting bands in this condition.

If, therefore, and, in view of these fundamental conditions, in cases of trench-foot, for instance, this capillary pressure can be kept low, while the arterioles recover their normal tonus, either naturally or through the administration of vaso-constricting chemical substances, as adrenaline, strychnine, etc., on the one hand, and the venous obstruction is removed through gentle massage, on the other, then the condition may become amenable to successful manipulation.

The chief danger in both conditions, in true frost-bite as well as in the chilling of tissues, lies in the ensuing capillary over-pressure, followed by excessive exudation, both of which must, at all events, be kept down by a timely and proper treatment of the parts.

Quite recently, some of our Italian colleagues, examining frozen parts histologically, have pointed out rather significant changes as occurring in the elastic fibers of certain blood vessels; whether these are subject to the same —6° C. temperature law established by Lake, or not, does not appear from his report.

H. G. Beyer.

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BOOK REVIEWS

Blood Pressure—Its Clinical Applications, by George William Norris, A.B., M.D. Philadelphia: Lea and Febiger, 1917.

This work is a very timely, intelligent and complete treatise of a subject of great interest to every practicing physician and surgeon, as well as to life-insurance examiners and men engaged in making physical examinations for the Army and Navy.

It is an excellent guide on a subject about which there has been much discussion and not a little misconception, misunderstanding and misinformation in current medical literature. The work is written in a clear style, the illustrations are adequate, and the treatment of the subject well arranged.

There are excellent chapters on the physiology of blood pressure and good descriptions of the different types of apparatus for registering it, with diagrams. Then follow chapters on venous blood pressure, arterial hypertension, blood pressure in various acute and chronic diseases, and exogenous intoxications. The chapters on blood pressure changes from normal in cardiac diseases, arteriosclerosis and nephritis and the effect of drugs and granular extracts are particularly interesting. Chapter XI, beginning page 274, gives an excellent summing up of the significance of increased blood pressure and clears up a good many misconceptions on this subject.

Altogether this work is admirably arranged and clearly written, and the whole subject is well considered. It contains practically everything of value that has been learned by laboratory experiment and clinical experience on the subject, and wastes neither the writer's space nor the reader's time in the discussion of abandoned theories.

It may be safely said to contain everything of any value on the subject that has been developed up to the present time. Wm. H. Arthur.

The Treatment of Infected Wounds, by A. Carrel and G. Dehelly; translation by Herbert Child, Captain, R.A.M.C. (ty.), formerly Surgeon French Red Cross. Introduction by Sir Anthony A. Bowlby, R.C., M.G., K.C.V.O., F.R.C.S., Surgeon General Army Medical Service, Advising-Consulting Surgeon to the British Armies in France. New York: Paul B. Holber, 1917. Price, $2.00.

This most timely and useful translation is an exposition in detail of Carrel's method of treating infected wounds. The book conveys in the clearest manner the knowledge of those details which have been so carefully elaborated by the patient work of two years. It repeatedly emphasizes the fact that it is only by scrupulous attention to every detail that the best results will be obtained. In the preface Sir Anthony Bowlby urges that, if the method is to be fairly judged, no change whatever should be made either in the Dakin's solution itself or in the use of the tubes for instilling it. He deplores the tendency to "improve" the method and states that the only modification that seems justifiable is the use of the syringe when instillation by gravitation can-

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not be carried out, as in trains, ships and many units at the front. The original method should be given a prolonged trial before modifications are introduced.

Interesting observations, facts and figures are presented in the authors' introduction. Sir Almoth Wright's teaching that "the treatment of suppurating wounds by means of antiseptics is illusory, and that belief in its efficiency is founded upon false reasoning" is attacked and, the reviewer believes, successfully. It is shown that it was a mistake to completely forget the fundamental observations of Lister and treat wounds with saline solutions or the hypertonic solutions of Wright. It being apparent that surgical infection, at the outset, is always local and in war wounds is carried by projectiles, and especially by fragments of clothing impregnated with microörganisms, the question then is simply how to destroy them without harming the tissues. As a difference of resistance exists between, on the one hand, the tissues provided with a circulation, and, on the other hand, microbes, isolated anatomical elements and necrosed tissues, it was useless to seek a substance which would exercise an elective action on microörganisms. Better seek to discover, for a given antiseptic, that degree of concentration of the solution and length of time during which it must be applied, which, though fatal to microbes, will not produce obvious damage to the tissues. The method is one of chemio-therapy and is the result of Dakin's studies of the action of many different antiseptics on tissues and microörganisms. Chloramines and hypochlorite of soda are the chemicals finally selected as they are endowed with feeble irritating qualities, with a toxicity almost nil, but of considerable bactericidal power. Research demonstrated that the microbes disappeared if the antiseptic remained in contact with the surface of the wound at a certain degree of concentration during a prolonged period. This demonstrated the falsity of Wright's contention.

It is maintained that the infection of war wounds would be unsuitable for treatment by vaccines and serums, as the inoculation of the tissues by projectiles or fragments of clothing is massive and the germs protected by necrosed tissues or blood-clots multiply beyond the reach of the lymph flow. The bacterial flora of war wounds is extremely varied and, as the large numbers of wounded and the conditions of the dressing stations render impossible identification of the microbes which infect the wounds, it would be necessary to use vaccines or serums against dozens of types of germs, aerobic and anaerobic, an obviously impracticable procedure.

The method was applied first to old wounds, and later to recent ones as a preventive measure. Infection can be checked even after suppuration has become established. All infected wounds are now brought more or less under control by chemio-therapy.

It is a matter of deep regret to the authors that the method has met with so much opposition from men at the head of the medical profession in France that it has been employed, in its integrity, in only a limited number of hospitals. They state that the best way to learn the method is to see it applied, and the book is intended to recall essential details of the technique to those who already know something of its application.

FRANCIS M. MUNSON.

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ELEMENTS OF FIELD HYGIENE AND SANITATION, by Joseph H. Ford, Colonel, Medical Corps, U. S. Army. Philadelphia: P. Blakiston's Son & Company, 1917. Price, $1.25 net.

Colonel Ford's manual of 240 pages discusses personal hygiene, the march, camps, water, the messing of troops, camp diseases, and gives illustrative regulations concerning camp hygiene and sanitation. It contains an excellent index. While the book is a little too large to carry in the pocket, it is small enough to be included with ease in the field equipment of a medical officer, and the writer would recommend that it be so carried for the following reasons:

1. It is a skillful condensation of the principles of field hygiene and sanitation.

2. It contains the experience with various sanitary devices gathered by our troops and medical officers in the expedition into Mexico, and the author has also had first hand experience as an observer in the present war.

3. The book contains 152 illustrations, mostly of sanitary devices, usually with detail drawings and other information which will enable the sanitary officer to construct them.

This third feature is especially valuable. However well the medical officer may know the principles of sanitation, these principles are of little value until they are applied. Unless the sanitarian is a practical inventor, he will find much difficulty in making an efficient device to meet the immediate necessity. Even if he is an inventor, it will do him no harm to first ascertain the merits and defects of the devices that have been tried already.

For this purpose the book will be a very useful addition to the working library of sanitary officers, and it is to be recommended to medical officers recently called into the service as a concise exposition of the principles of field hygiene and sanitation.

E. B. VEDDER.

SURGICAL NURSING IN WAR, by Bundy. Philadelphia: P. Blakiston's Son & Company, 1917.

A timely booklet with valuable suggestions for all nurses but especially for those who contemplate service in military hospitals. Information has been collected from many sources concerning new methods of treatment based on well-established principles, and the result is not only interesting reading, but there are numerous practical and important points peculiar to war conditions clearly set forth.

G. M. NEVINS.

AMBULANCE DE "L'OCEAN" LA PANNE (Belgium). Travaux publies sous la Direction du Dr. A. DePage. Secretaires de la redaction, Dr. A. P. Dustin, Dr. G. Debaisieux. Fascicule I, Juillet, 1917. Masson et Cie, Editeurs, Libraires de L' Academie de Médicine, 120, Boulevard Saint Germain, Paris.

This is the first number of a semi-annual periodical published to show the activity and results attained at the great Belgian Red Cross Hospital established at La Panne at the suggestion of Elizabeth, Queen of the Belgians. La Panne is on the North Sea, just inside the French frontier and about 12 kilometers

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behind the trenches. The hospital owes its name, "Ambulance de L'Ocean" to the fact that the first building occupied was l'hôtel de l'Ocean.

The introduction is a full and interesting description by Dr. A. DePage, the director, of its foundation, evolution and organization. This last is now thorough and complete. Its capacity is 1,000 beds, but in case of necessity this can be raised to 1,200 or 1,500. The average number of patients is from 500 to 600. It was established at La Panne in order to have a hospital complete in itself on Belgian soil, as near as possible to the trenches where the seriously wounded could receive early and competent treatment and the cases retained until complete convalescence, thereby enabling the medical service to make intensive studies and compile reliable statistics.

An annex to the hospital, an advanced post, so to speak, has been established near Dixmude, 3 kilometers from the front, for urgent operations on wounds of the abdomen. This is composed essentially of four automobiles arranged in a rectangle and supporting a double walled tent, heated by electric radiators and containing 14 beds. The automobiles contain the pharmacy, linen-room, dark room, sleeping quarters for the medical personnel, etc. In addition to laparotomy cases, severe external hemorrhage and shock are treated.

An important adjunct to L'Ambulance de L'Ocean is L'Institut "Marie DePage" for the study and perfection of the treatment of wounds of war and the conservation and utilization of the innumerable scientific records furnished by the study of the patients treated at the hospital since its foundation. Funds from America paid for the construction of the pavilions, the Rockefeller Foundation paying for the installation of the different laboratories.

The first monograph, "General Considerations on the Treatment of Wounds of War," is a brief but clear résumé of the subject. The Carrel-Dakin treatment is unqualifiedly approved and described in detail. The secondary suture of war wounds is well described and illustrated in the second article.

An excellent and most enlightening study is presented of cranio-encephalic wounds. Among the conclusions reached are the following:

1. Every wound of the scalp should be well cleared of débris.

2. All bony lesions of the skull require trephinning.

3. The gravity of cranio-encephalic wounds results from the existence of meningeal lesions.

4. The early removal of all foreign bodies, including the projectile, should be practiced.

5. Simple wounds of the head should be sutured at once; those slightly infected, after 48 hours. Others should receive the Carrel treatment with secondary suture.

6. The results, excellent in simple head wounds, become much less so in the case of complicated lesions. Immediate intervention constitutes the treatment which prevents the most complications, immediate and late.

7. Cranioplasty (cartilagenous and osseus) is indicated for protection and for esthetic reasons.

8. The prognosis of cases trephined early is less dark than is generally admitted.

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A chapter on the reduction and mechanical retention of fractures of the jaws is well illustrated.

Favorable results are reported from the intravenous injection of peptone in the treatment of grave pyogenic infections.

The chief of the neurological service urges that all wounded patients be given a neurological examination soon after entering the hospital, and provision made for their early treatment by specialists.

The technique of surgical intervention in wounds of the peripheral nerves, as practiced at "L'Ambulance de L'Ocean," is described and illustrated.

Several instructive and timely monographs are presented giving the results of research work in "L'Institut Marie DePage." These are "Prophylaxis" and "Treatment of Tetanus," "Researches on the Blood Pressure in the Course of Intoxications by Gas," "Apropos of the Employment of Sugar in the Treatment of Wounds Infected by the Bacillus Perfringens," "Apropos of the Presence of Bacillus Perfringens in Recent Wounds," and "Examination of the Uniforms of the Belgian Soldiers from the Point of View of the Presence of the Spores of anaerobic Bacteria and more particularly of the Spores of Bacillus Perfringens."

FRANCIS M. MUNSON.

THE TREATMENT OF WAR WOUNDS. Compiled at the request of the National Research Council by W. W. Keen, M.D., LL.D., Emeritus Professor of Surgery, Jefferson Medical College. Philadelphia and London: W. B. Saunders Company.

This timely report does not pretend to be complete, but is only a memorandum on some of the more important and most recent improvements in the treatment of war wounds and, coming from the authoritative pen of Professor Keen, himself a Civil War veteran, will be most useful to medical officers about to take part in the great conflict.

The author brings out the following points wherein, from a surgical point of view, the present war differs from any preceding wars: (1) The huge numbers in the armies and, therefore, of the wounded; (2) the new means of transportation; (3) the new weapons, especially in the artillery; (4) rampant infection of wounds; (5) the conquest of infection by more efficient anti-septics and by new methods.

He also mentions, but does not discuss, the advance in reconstructive surgery of the face and jaws by the coöperation of the dentist and the surgeon, the great development of war orthopedics and the training of disabled soldiers. He also calls attention to our reversion to medieval steel helmets and corselets as a means of preventing wounds.

Under the first heading he states that in the care of the thousands of urgent cases requiring treatment after each "drive," the greatest good of the greatest number must be the rule, but, on the other hand, an abdominal case or a case of internal hemorrhage, even if it does involve time, must have precedence of a dozen who can wait. For the same reason and for want of the needed aseptic conditions, few abdominal cases, and few if any injuries involving the brain, should be operated on near the front. Shock from severe wounds and hemorrhage must take precedence of everything else.

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The importance and advantage of the new means of transportation by automobile, whereby the wounded may be brought to the hospitals within a few hours, is commented upon. Diagrams are given, showing the zones of collection, evacuation and distribution in the United States Army and in the British Army. New methods of treatment during transportation, especially of fractures, are mentioned.

The changing character of the wounds received in this war is referred to. At first bullet wounds predominated, then shrapnel, and now the high explosive shell is the chief weapon. Emphasis is laid upon the certainty of infection in neglected wounds and the widespread devitalizing of the tissues caused by the shell fragments. The common-sense practice of excision of the tissues surrounding the wound itself, after primary disinfection, is endorsed.

The failure of both antisepsis and asepsis, as at first practiced in this war, is explained as being due to the lack of sufficiently effective antiseptics and to defective technique. Prevention and cure of sepsis are now both possible by the Dakin-Carrel method which is described in minute detail.

The apparent merits of "acriflavine," "proflavine," "mercurophen," "eusol," "eupad" and "brilliant green" are spoken of and their further test by a more extensive use is urged.

The author embodies in the report a brief statement of the general principles underlying the removal of foreign bodies by the aid of fluoroscopy, by Dr. E. W. Caldwell of New York City. This writer gives, in some detail, the method used to obtain the stereo-fluoroscopic image which shows the relation of the exploring needle to the foreign body as accurately as it could be seen if exposed in the open air.

The prophylaxis and treatment of tetanus is dwelt upon and the Memorandum on Tetanus, issued by the British War Office Committee on the Study of Tetanus, in which the necessity of several successive protective doses of serum is properly emphasized, is appended.

Gas infection and gas gangrene are described, and the paramount importance of the earliest possible treatment during the first stage of rapidly spreading infection, before the production of gas in any serious quantity has occurred, is emphasized. The recent announcement, by the Rockefeller Institute, of an antitoxin to prevent gas gangrene is mentioned and the experiments and reasoning leading to its production are approved.

Under the caption, "Wounds of the Head," Professor Keen quotes and endorses the conclusions of Dr. Harvey Cushing in his articles in THE MILITARY SURGEON, June-July, 1915, as follows:

"There is a fairly universal agreement that almost all cranial wounds produced by projectiles, even though they appear trivial, require surgical investigation, with the possible exception: (1) of certain of the tangential longitudinal sinus injuries, which, according to Sargent and Holmes, have a high degree of spontaneous recoverability, and which, when investigated, present unusual surgical risks; and (2) of certain of the fractures of the base due to perforating wounds, owing to their inaccessibility."

Early surgical interference in cranial injuries, except for the control of ex-

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tensive hemorrhage, is not approved. The author insists that the only proper hospital in which to operate on such cases is one in which facilities in skilled men, both neurologic and surgical, and the best X-ray apparatus, are to be had. Excision of wounds of the knee joint, with primary closure of the joint, is approved.

The report states that in wounds of the abdomen, section is now the rule, unless there is good reason to believe that the viscera have *not* been wounded. This is due to the great increase in wounds inflicted by bombs, grenades and high explosive shells. The importance of the earliest possible operation is emphasized.

The technique of the treatment of burns by improved paraffin dressings is described and two formulae are given.

FRANCIS M. MUNSON.

LES PLAIES DE GUERRE DU POUMON (The War Wounds of the Lungs). Notes on their surgical treatment in the war zone, by Pierre Duval, Medécin-Chef de l'Ambulance chiurgicale automobile, No. 21. Paris: Masson et Cie, Editeurs. Libraires de l'academie de medécin, 120 Boulevard Saint-Germain, 1917.

This brief but concise work is the result of the observations in common of the surgeons, physicians, bacteriologists and radiologists of the ambulance unit of which the author is chief. It is not a complete study of the war wounds of the lungs, but a short treatise on the particular points that have attracted their attention. Having in view the veritable revolution in the surgery of the lungs that has been presented during the war, they plead for the application to wounds of the lungs of the general rules of military surgery and maintain that this is superior to expectant treatment. Statistics are given showing the great mortality from wounds of the lungs and an appeal made for efforts toward improved treatment.

The chapter on Pathologic Anatomy contains several fine plates in colors and several photo-engravings of radiographs. The conclusion reached from a study of hemorrhage and its treatment is that direct hemostasis of dangerous hemorrhages from wounds of the lungs would save two-thirds of those so wounded, and that thoracotomy is the procedure of choice. The various infections of wounds of the lung are described, as well as that of the hemothorax which accompanies them. It states that a great number of reported cases of traumatic pulmonary gangrene are in reality cases of abscess of the lung and of septic pneumonia, and that gaseous gangrene of the lung had not been encountered.

Under the heading of Operative Treatment the following observations are made:

The great mortality calls for all efforts to find a better treatment.

It is due to infectious pleuro-pulmonary complications so frequent in wounds of the lung.

The examination of pulmonary fragments shows that wounds of the lung are entirely assimilable to every wound of warfare, in that the lesions are the same, the bacteriologic state is identical, the anatomical lesions are charac-

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terized by the same destruction, the same cellular mortification and the same hemorrhagic infiltration. wounded lung, as wounded muscle, is a medium well suited to the culture of the organisms of infection. Wounded lungs contain the same foreign septic bodies, projectiles, débris from the clothes and splinters. In view of the foregoing the author inquires why it is not logical to apply the general precepts of military surgery to wounds of the lungs, and states that the immediate treatment of the wounded organ is the only rational treatment. This alone avoids the most grave of the early or late complications, pleuro-pulmonary infection. The opportune time for surgical intervention is discussed and the conclusion reached that on this point, as on others, the general rules of military surgery should be followed.

The surgical treatment of the wounds of the lung known as "open thorax" in which the air penetrates directly into the pleural cavity at every respiratory movement, is described. Arguments are presented favoring a complete operation, *e. g.*, the removal of foreign bodies, etc., and not the simple closing of the wound. It should be considered a curative procedure and not a simple prophylactic measure.

Operative technique is described in detail. Operating rooms for hypopression and apparatus for respiratory hyperpression are stated to be physically rational, but their employment is limited by their inconvenience and their difficulty of transportation. It is maintained that thoracotomy with total pneumothorax does not impose any limitation on the manipulation of the lung and is the procedure of choice for intrathoracic interventions.

Local anesthesia by cocaine is given as the method of choice for early operations.

Thoracotomy according to the method of Willy-Meyer is described and illustrated. The examination of the lung, hemostasis, the extraction of foreign bodies, the treatment and suture of the wounded lung and pleura, the closure of the thorax, the treatment of the parietal lesion and the post-operative treatmen are dealt with in detail.

This book is the last word from those best able to speak on the subject.

F. M. Munson.

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REPRINTS AND TRANSLATIONS

WAR DIARY OF A CONSULTING SURGEON WITH THE ADVANCE

By Professor C. GARRÉ, of Bonn, Germany

Generalarzt, VIII Army Corps[1]

THE mobilization of the army for war is completed. After spending days of nerve-wrecking suspense our brave troops, marching, enter the town of ——— with hurrahs. Shell shattered bridges, demolished depots and positions, uprooted trees obstructing the road, show us that we are now in the enemy's territory.

St. H———, the beautiful town with its old cathedral, becomes the gateway of our advance. The headquarters of our commanding general arrives the next morning and regiment after regiment passes in review before the commander; the light field artillery as well as the heavy howitzer batteries, in splendid equipment of horses and men, clatter by at an easy trot, followed by ammunition columns, hussars, cuirassiers, machine guns, wireless telegraph and telephone companies, field hospitals and ambulances, the transport corps in long columns, the aviators, the heavy pontoons of the pioneers and all the other formations of a modern army.

From 9 o'clock in the morning till 7 o'clock in the evening they march past, a tremendous reserve army and a striking picture of a nation's strength.

A captured spy, who was led blindfolded by some of our soldiers, and some wounded from the enemy's ranks completed the picture in all its seriousness. The first wounded who needed our medical assistance were French soldiers who were captured by our advance cavalry; they and our wounded men found shelter in the homes surrounding the battlefield. Many a brave fellow there received first aid for his injuries, who continued the fight in a most heroic manner after being wounded. I especially remember one of these cases, a cuirassier, who, after having been shot through his left arm and the abdomen, stayed in his saddle, escaped the enemy and came galloping into our quarters one hour after receiving his wounds. He and another enduring hero, Captain H., whose right lung was pierced by the enemy's lance, recovered completely, and I had the satisfaction to meet them four weeks later as convalescents at the field hospital in B———.

[1] Through kindness of Maj. John R. McDill, M. R. C., U. S. A., lately with the American Red Cross in Germany.

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The following day (Aug. 22) found our corps as flanking guard to protect our action against the village G———.

Aug. 23. A frosty foggy morning. Advancing over narrow meandering roads, leading through field and woods, we pass our own-marching divisions. We hear the first shots fired by the enemy and after having passed the hillside which lay before us, we suddenly find ourselves on the battlefield, the scene of a night attack. The fighting is still on in the nearby village, whose inhabitants treacherously fire upon our soldiers from their hiding places. This attitude made it necessary for our men to storm every house separately before taking possession of the village.

Our surgical staff had already erected temporary quarters and was in full action. On a gentle slope of a nearby field the wounded were laid out and given first assistance. Those found to be severely wounded were carried on stretchers into two nearby primitive huts. The entrance into one of these was obstructed by the cadaver of a horse. In these low, dimly lighted rooms I found more than a dozen soldiers, suffering from shot wounds (mostly in the chest and abdomen), which had already been dressed by their respective regimental surgeons. I cannot pass without commenting on the most remarkable self-control and bravery of these poor boys; not a moan, no complaint escaped their lips, and only the twitching muscles and sorrowful eyes gave evidence of their untold sufferings.

In the meantime a field hospital had been erected in the neighboring village G——— (3 km.) and there these wounded were transported. As the fighting went on and more and more wounded were brought in from the battlefield, it became necessary to establish two new surgical staff quarters and also two additional field hospitals. Towards evening the roar of the cannons ceased and the reports of the rifles grew faint and fainter, giving evidence that the enemy was retreating. We at once proceeded to search the blood-drenched cornfield for the wounded, caring for friend and foe alike.

Upon entering the little village of P———, we found most of the buildings afire. Wounded, prisoners and franctireurs, who were caught redhanded, are led away. Along the roadside, in orchard and field, the dead lay as they fell, Frenchmen and Germans side by side, all strife ended. Lamenting women weeping aloud are searching the ruins for their dead and others make vain efforts to drive the cattle from the burning stables.

Our troops advance on the main street as the guns of the enemy proclaim the continuance of the fight. A few miles further we again come upon the enemy, who here holds a strong, well fortified position in the

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village of B———. One of our divisions is ordered to charge immediately and at 6 o'clock the enemy retreats. Half an hour later the Surgeon General and I are busy looking for suitable quarters for the wounded in the captured village. Field ambulances are rushing to and fro, bringing in the maimed and suffering victims of the day. Sentinels on duty are guarding every roadway leading into the village, giving all necessary information; but in spite of their watchfulness our adjutant is shot and falls from his horse just as he leads the regiment through the village, a victim of a cowardly franctireur, who fired the fatal shot from the window of his barn.

Fortunately for our men the sentiment towards our troops is not as hostile and treacherous amongst all the villagers. As an example I found 8 severely wounded in one dwelling, where upon beds, tables and kitchen chairs resting places had been arranged by an old woman, who gave these men motherly care. In the trenches in the rear of this house the wounded were lying amongst the dead, and the former were trying to assist each other in cleaning and dressing their wounds in true comrade fashion, using the small well-known packages of first-aid supplies. I saw three different styles of the "pansement individuel," each being larger than the package customary to the German army.

Our services were then required in the neighboring village of H——— (5 km.) where the 2d Sanitary Company had its headquarters. Hospital tents were erected on the open field and about 80 to 100 wounded were cared for. Some amputations were necessary and were performed successfully.

We hear that Colonel P. and some officers are lying wounded in a small inn nearby. Arriving there we find that our friends are already in the care of an army surgeon.

Meanwhile darkness had set in; we try to find the staff of our commanding general, but are warned not to pass through the forest, as not an hour ago two of our cyclists had been shot therein by snipers. The problem now is to find shelter for the night. The little depot is overcrowded with French captives and interned Belgians—a forbidding looking crowd. The inn across the road is filled with our wounded and the bar is rushed with our men who try to get a glass of beer or wine. Finally we succeed in finding a few vacant beds in a neighboring hostelry but, being without any food since 4 o'clock in the morning, we are so hungry that we cannot sleep. All we could get was half a loaf of bread and a bottle of wine among three.

Aug. 24, 1914. We break camp at 4 a. m., visit two field hospitals and try to get in touch with our staff. The field hospital in St. D——— was not yet completed, but the other in G——— had succeeded in providing shelter for 130 wounded in the schoolhouse and in adjoining

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buildings. Only a few beds being available, most of the wounded had to be laid on straw.

It was no easy task to locate the present whereabouts of our commanding general and his staff; nobody could furnish any information. So we (my assistant and myself) determined to try our luck and resumed our search by automobile. After hours of aimless driving we fortunately meet the staff of one of our divisions and I get an order to inspect the field hospital, which sanitary company No. 1 had erected near G——— and the field hospital No. 3 with its numerous severely wounded. Here we find two small rooms in a private home serving as operating rooms, the necessary hot water being furnished from the adjoining kitchen. The neighboring schoolhouse affords room for forty severely wounded in comfortable beds. The slightly wounded found shelter in the church. Some officers and the surgeons were given quarters in the parsonage. Provisions are good and plentiful and a staff of trained nurses is administering to the needy.

I was ordered back before the approach of darkness would endanger the passage through the forest. Hardly a day passes without the franctireurs being up to some of their cruel, underhand work. I saw victims of their cowardly sniping who had been guarding a provision van. In connection with this affair seventeen inhabitants of L———, including the parson and the mayor of this village, were executed after having been convicted.

Four days later I again visited field hospital No. 3; the work was still being carried on and the number of the wounded had increased to 260. In total 800 wounded were dressed and cared for there, amputations numbering fifteen.

Aug. 25. The enemy is reported retreating and the corps commanders order our advance to S——— for tomorrow. At the dawn of day our troops resume their march and at 2.30 p. m. we cross the French border in sight of S———, the historical battleground of 1870.

Our advance guard is already engaged and our regiments are rushed forward. A fierce battle ensues, which lasts till darkness calls a temporary halt. Long before daybreak our artillery was wheeled into new positions and reopened hostilities with apparently good results. Throughout the whole day both sides kept up incessant firing and the struggle is carried on.

The first temporary surgical quarters are erected right behind the firing line; about a dozen wounded are lying there in the shade of the trees; a surgeon is supervising his assistants in the care of them. Every hour increases the number of the victims; several score of wounded have already been transferred to the village, where the chief surgeon ordered the church and a spacious private house to be turned into

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hospitals. Wounded officers are brought in; I dress their fractures with improvised splints and get them ready to be transported.

Outside the battle is still raging; our troops are gaining territory; the Frenchmen retreat to the hills. We erect another field hospital in the captured village of G———, where we find a suitable large building, which formerly was used as a home for the aged. It offers space for 200 wounded, which are taken care of by our Red Cross nurses and sisters.

At nightfall it begins to rain and we receive the order to remove our field hospitals from G——— back to the other side of the river, a measure of precaution. The staff of our division goes the same way. After having crossed the pontoon bridge we proceed in pitchy darkness to a suitable camping site, our supper consisting of a piece of French "zwieback" and a cupful of wine.

The frosty morning brings us some relief and before the battle continues we are glad to grasp that long-wished-for opportunity to change clothes and a chance to wash. Soon our troops advance again and we are compelled to arrange for more wounded.

Late in the afternoon of Aug. 29 our storming infantry breaks down the last resistance of the enemy, who is now in full retreat. We continually press forward and on Sept. 1 we take the fortified French position at the A——— canal, following the enemy over the plateau of C———, break and pierce its line of defense in S—— P—— (Sept. 3) and on Sept. 5 our advance guard reaches the river M——— before V.

During those trying days our corps advanced 100 km. within a week. It was astonishing to note how few of our men reported sick if you consider the scanty rations, which consisted mostly of raw beets or half cooked meat of cattle, slaughtered half an hour before. Cases of gastric diseases were plentiful, but most of the sick made heroic efforts to keep on marching and fighting, in which they usually succeeded by means of large doses of aged French claret.

On the morning of Sept. 3 my auto struck and I had to harness a team of horses to it, which had to be changed in every village. Progress was thus very slow and it was not until I reached S——— P——— (40 km.) that I encountered our staff again. Sanitary Company No. 2 had just completed their work and 280 wounded were lying well taken care of in tents. The staffs of the field hospitals No. 4 and No. 10 had just entered the still burning village to find shelter in some intact barns and farmhouses.

The following day (Sept. 4) brought us plenty of work. In S——— a number of severely wounded were waiting for medical attention. In a hut there I found six Frenchmen: two, shot through the brain, *in extremis;* some with arm and leg wounds, and a poor fellow with burst

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open abdomen. All his intestines lay swollen and fibrin-covered in a heap between thorax and upper thigh. He had been wounded on Aug. 31, so he had lain fully four days in this deplorable condition; yet his pulse was fairly strong.

In the police station I found thirty German wounded who had been brought there during the night and now awaited surgical treatment. The majority of their injuries were fractures of the extremities, rifle wounds, also a few shots through chest or abdomen. Luckily we had the necessary dressing material and the appliances for an emergency operation at hand, but we had to improvise splints and paddings. After having finished our work we raised a home-made Red Cross flag to show the returning ambulances where our patients were located.

Sept. 5 saw us in C———, where together with the Surgeon General I was busy hunting suitable locations for our field hospitals. Here we also replenished our medical chests at the drug stores of the city and paid with "Bons." At the fashionable hotel we could not buy a meal as everything had been sold out. By means of some diplomacy, a little bit of French and some money I finally succeeded in obtaining a piece of Camembert cheese and a bottle of wine—a royal dinner for three disciples of Aesculapius.

Meanwhile our troops had advanced to V——— on the M———. That evening at seven o'clock the enemy began to shell our positions and this was the commencement of a five days battle, after which the medical corps were ordered back although our troops held their positions.

As the fighting increased we often were at a loss to know where to place the incoming victims of the battlefield. Soon five field hospitals were in full action and kept ready to be removed on short notice. Our ambulance train, while removing the wounded from the field, was fired upon with shrapnel; nevertheless over 200 patients were brought in and taken care of. The seriousness of the wounds dressed here surpassed everything that I had witnessed so far. At the beginning of the campaign most of the cases were injuries inflicted by rifle shots; here at the Meuse the greater percentage of the wounds were caused by bursting grenades or shrapnel. Although many cases of dum-dum injuries were reported and dum-dum cartridges had been found in a deserted house in V———, I did not have any of these cases to treat.

I soon abandoned the aseptic treatment of wounds which at first seemed practical for the common injuries inflicted by infantry rifles. After painting the wounds with iodine we cleaned them by washing them with a solution of bichloride of mercury and afterwards bound them with a compress saturated with sublimate. Old, dirty or infected wounds I lightly touched with tincture of iodine or cleansed with a weak solution of iodine. The results of these methods, as

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far as I could ascertain, have proven highly satisfactory. At that time of the war we only occasionally met with those terrible wound infections such as gas gangrene, etc., which in the latter part of the campaign unfortunately became so numerous. A case of gas gangrene (Aug. 24 in G———), which necessitated an *ex articulatio humeri*, was the only one of that kind for a long period.

Sept. 10 at 1 o'clock in the morning we were alarmed and the order was given to vacate V——— before 8 o'clock because at that time the bridge over the M——— river was ordered to be dynamited. For a short time pandemonium reigned but soon order was restored and at 3 o'clock the last of our ambulances and the last of our men crossed the bridge in safety. We then turned northwards and soon our wagon train catches up with our troops marching in close formation. An awful mixup resulted, which at its best was dangerous, but we had to pass ahead on account of our wounded. Finally we again reach S——— and try to find shelter. Nobody knew where our corps was located and camping.

The next morning we moved our quarters to a house in the city, which overlooked the main street. By chance I detected some of our men passing by and in the evening the whole staff of our commanding general was assembled in the little village of P———, the center of the following engagements. It was here that I was decorated with the Iron Cross by General von T——— in a way which I will always be proud to remember.

In the beginning of the war it was not a hard task to select those wounded who were fit to be transported to the army hospitals located in cities 16–20 km. in the rear of the front, but later on affairs became more complicated through the serious character of the wounds, the scarcity of suitable rooms and the insufficient supply of ambulances.

All our field hospitals sent their wounded back to V———, where the surgical corps of our army had its headquarters and six or seven hospitals received the incoming wounded. These lazarets were improvised in several schoolhouses, in the theater, the hospice and in the large armory. Many of our wounded officers were cared for in private homes.

On the third day (Sept. 21) most of the urgent surgical work was completed and I was ordered to S———, where I had ample opportunity to see the wonderful equipment and perfect organization of our large etappen hospitals. Hardly three weeks after we had taken possession of this town, these hospitals were working with nearly the same apparatus as in times of peace. The X-ray outfit works to perfection, the operating rooms are faultlessly equipped and here the trained Red Cross nurses silently carry on their merciful work as well as in all the

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other departments of this great institution. Nearby a field laundry is being opened and nothing is left undone that might add to the welfare and comfort of the patients.

We spent several days in quiet, attending to the wounded, but not for long. Late in the evening on Sept. 25 our army is ordered to attack and the next morning at 4 o'clock the staff of the commanding general follows. At 6 o'clock we hear our batteries on the right wing opening the fight and soon the entire line is heavily engaged. At 8 o'clock the first wounded are brought back. We ask how things were at the front. "We stormed and captured one battery," comes the reply. Soon the first French captives were led by; they tell us that their companies were reduced by casualties from 300 to 130 and 84 men and were under command of a sergeant.

Our troops advance and we establish our surgical headquarters in the village of T——— where the schoolhouse is turned into an operating room. The delirious and the mortally wounded are taken to a low, dilapidated barn. There the army chaplain kneels at the side of a dying soldier, while I try to relieve another sufferer from his terrible pains by an injection of morphine. A second ambulance company arrives and now we have four surgeons at work.

From noon to night without interruption the wounded are brought to our doors and are rapidly selected as to the nature of their injuries. In a rush like this, the field surgeon must try to administer to all. A thorough dressing of the wound and a proper setting of broken or fractured members is the main principle of successful field surgery. It is advisable not to undertake any operations except in most urgent cases. The state of exhaustion in which the wounded is generally found should be sufficient warning to any experienced surgeon. I have seen five wounded who have been operated upon immediately and only one survived; shock, gangrene and sepsis were the causes of the other deaths.

Injuries of the head were only cleansed here, the surrounding hair shaved off, scalp particles cut off and bone splinters removed, but no trepanations attempted. They are left for the operating surgeon at the field hospital. Wounds of the chest with open pneumothorax I fixed with tampons. All injuries of the lungs recover remarkably quickly when kept absolutely quiet with the aid of morphine sulph.

The next morning saw us busy transporting our patients to the field hospital. Whoever was able to walk, walked; others were transported in wagons, and even most of the severely wounded were slowly carried onward in ambulances and automobiles. Soon I returned to my old quarters in M———, where I resumed my work in the four field hospitals there.

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CLINICAL NOTES

OBSERVATIONS ON THE EYE, EAR, NOSE AND THROAT WORK AT BASE HOSPITAL NO. 2, FORT BLISS, TEXAS, DURING MOBILIZATION

By Lieutenant Colonel E. M. TALBOT
Medical Corps, U. S. Army

The Eye, Ear, Nose and Throat Clinic at Base Hospital No. 2, Fort Bliss, Texas, during the period I had charge of that service, was a very busy one, as patients were drawn not only from the thousand of troops in the vicinity of El Paso, but also from Mexico and other stations along that section of the border.

The average number of cases treated daily was about one hundred and fifty, nearly equally divided between hospital and out-patients. The latter came with the least formality possible, an informal note or verbal request being all that was necessary to obtain treatment. In fact the only real requisite to receive treatment was that it was required.

In the military service, as in civil practice, the eye is subject to many injuries, often serious, and to many diseases peculiar to the organ. It also shows characteristic lesions in general diseases such as syphilis, arteriosclerosis and chronic interstitial nephritis. I had two cases in which the diagnosis of chronic interstitial nephritis was made from the fundus picture and later confirmed by urine examination. There is no other place where blood vessels can be seen so clearly as in the eye, the virtual image of a direct opthalmoscopic examination magnifying them fourteen times.

Many refractions were made, the object always being to get the best glasses possible for every case, rather than to obtain a great number of prescriptions. In all cases preliminary mydriatic and post-mydriatic examinations were made, followed by the prescription for lenses if required, great care being used, especially in the axes of the cylinders. I can but feel that the care of the eye is often too lightly considered, especially by some of the patients, who so frequently get glasses without consulting a physician.

The most common disease of the eye in our clinic was conjunctivitis, a very large proportion of the cases being caused by the pneumococcus (Group IV). There were hundreds of these cases, the greatest number occurring in December. The usual course is an inflammation of the conjunctiva of one eye, which increases rapidly, so that in six or eight

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hours there is a free muco-purulent discharge which often runs over the lower lid and blurs vision. There is a persistent feeling of sand or foreign body in the eye and even boracic acid solution smarts very much when applied. There is general lassitude, but usually no fever. The pneumococcus is found both in smear and culture at this stage, in all cases being of Group IV, as we know, the least virulent. On the second day the lids are more swollen, but the discharge is decidedly diminished. The feeling of a foreign body no longer exists, and boracic acid solution and argyrol give a feeling of comfort. The marked sensitiveness has disappeared and also the pneumococci, which are seldom found on the second day or later if the eye has been properly treated. The inflammation rapidly disappears and the eye is soon normal. However, the other eye is often involved, usually about the third or fourth day.

Some cases of conjunctivitis were caused by the streptococcus, staphylococcus, Kock-Weeks bacillus, Morax-Axenfeldt diplo-bacillus and some by mixed infections. In one case many pneumococci were found the first day, but were absent two days later when the Morax-Axenfeldt diplo-bacillus was discovered.

There were a number of cases of gonorrheal ophthalmia, in only one of which the patient had gonorrheal urethritis. In this case both conditions were probably contracted at the same time. In all of these cases the eyes were saved with perfect results, except two which reached us on the third or fourth day of the disease, after the cornea had practically been destroyed. The great point, of course, is to get these cases early, for with careful treatment the outlook should then be good. When we consider the tremendous number of cases of gonorrhea in a class of men who are often far from careful, we must conclude that there is some immunity which protects the eye. As a rule the eye infection is from some other case. If the patient infects his own eye there is usually a history of some trauma of the organ which lowered its resistance. I remember two cases in my ward at the hospital, Camp Columbia, Cuba, both of which had gonorrheal urethritis and ophthalmia. In one the eye had been recently injured by carbolic acid solution, and in the other by a stick. The soil was prepared. I think a resistance, probably temporary, may exist in patients who have had a pneumococcus conjunctivitis, as I have not known of a single case of pneumonia following this disease.

There were many cases of iritis, both syphilitic and, so-called, rheumatic. The latter I am convinced are not due to rheumatism, but the eye and joint conditions are the result of some focal infection, usually located in the tonsils, teeth or gums.

There were some cases of interstitial and phlyctenular keratitis,

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also many corneal ulcers, the simple ones responding easily to treatment and those infected spreading and proving very persistent. In no instance, except the two gonorrheal cases mentioned, was the cornea perforated, but many nebulae or maculae resulted. It is most important to get ulcer cases early so that the cause, if possible, can be removed and treatment commenced.

Most of the pterygria were located to the nasal side, a few to the temporal; some were recurrent, following operations in which they had been cut off. In all our operations the pterygrium was tucked under the conjunctiva unless it was very large, when it was split, part going under the conjunctiva above and part below. The results were excellent.

Besides the cases of albuminuric retinitis cited, most of the lesions of the fundus were choriditis, all of them being diffuse conditions with masses of pigment, except one case of short duration in which the macula lutea of one eye was the only portion involved. There was one patient with a central scotoma caused by an embolism of a branch of the retinal artery, and one with medullated nerve fibers, an unusual but physiological condition.

Injuries of the eye occurred very frequently, in all of which antitetanic serum was administered at once. This is especially important if the eyeball is penetrated. The following cases may be of interest:

Case 1.—A soldier of the Pennsylvania National Guard was sitting in camp with several companions, when one of them threw a cartridge into the fire. Two pieces of metal from the cartridge entered his eye, cutting entirely across the cornea from above downward, passing back through the lens and iris, lodging one, in the posterior wall of the eye, the other in the orbit outside the ball. These were shown by X-ray plates and found later after an enucleation had been performed.

Case 2.—A soldier of the U. S. Infantry was burning rubbish in camp somewhere in Mexico when something exploded which he thought was a cartridge. His eye was severely injured and he was transferred to Base Hospital No. 2. When he arrived at Fort Bliss, there was a healed scleral wound about three-fourths of an inch long on the temporal side. X-ray examination did not show a foreign body, but the eye was enucleated, as it was partially collapsed and absolutely blind. A piece of glass slightly larger than a normal lens was found just back of and attached to the lens. Two other enucleations were performed, one for the gonorrheal ophthalmia mentioned, the other for a marked staphyloma, following an ophthalmia, which occurred months before the soldier joined this station. In all cases as much tissue as possible is left, the recti muscles are carefully secured with catgut and tied to

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each other and the conjunctiva closed with a purse-string suture of black silk which also catches the apices of the muscles.

Case 3.—A horseshoer of the 8th U. S. Cavalry while at work had a nail pierce his eye, entering near the cornea-scleral junction. As the nail fell out it pulled a portion of the iris through the wound. An iridectomy was done immediately with perfect results.

Cases 4 *and* 5.—Each soldier had an eye pierced near the cornea-scleral junction by pieces of glass from exploding bottles. In both cases the iris protruded through the wound, and in both iridectomies were performed with good results.

Case 6.—A militia soldier fell in his tent, a nail catching the inner side of the inner canthus and tearing outward. The wound extended from the lower lid about three-fourths of an inch upward and outward along the upper lid. This was repaired with excellent and really surprising results.

All broken noses (20) have been checked by the X-ray and given antitetanic serum. Satisfactory results have been obtained in these cases.

Many treatments of the nose have been given, the best effects being obtained in cases of sinusitis, especially of the frontal and maxillary, in which 4 per cent cocaine, adrenalin 1 = 1000, followed by a pack of 25 per cent argyrol, gave excellent results.

I have never seen so many cases of otitis media. They follow measles, pneumonia, tonsillitis, pharyngitis, or rhinitis, while others come on suddenly without a history of previous trouble. Many cultures have been taken, most of which show the streptococcus as the cause, some the staphylococcus, others the pneumococcus, Group IV, as in conjunctivitis.

If these cases are seen early, the following treatment will often produce a cure without paracentesis or rupture of the tympanic membrane: Warm 10 per cent phenol in glycerine dropped into the ear at frequent intervals, the head lying on the opposite side; 5 per cent tincture of iodine in glycerine on applicator to the throat behind the posterior pillars over the entrance to the Eustachian tubes, which reduces the swelling and often removes pus and mucus; hot Dobell's or normal saline gargle or nose-and-throat spray, together with rest in bed and free catharsis. If there is much bulging it is better to do a free paracentesis. This is necessary if there is mastoid involvement.

If the ear is discharging, apply the above treatment, using great care to keep the ear clean and to build up the strength of the patient. In other words, help nature as much as possible. Irrigations are not used unless mastoiditis exists. Then add frequent irrigations with

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hot boracic acid solution at a low pressure—8 to 12 inches—and constant application of hot, wet, boracic acid pads over the mastoid region. With this procedure most of the cases are cured. Neither the simple nor radical mastoid operation is done as frequently as formerly.

Vaccines, both stock and autogenous, were used in many otitis media and mastoid cases, but their beneficial effects have not been clearly established.

Many tonsillectomies and adenectomies were done under both local (novocain) and general (ether) anesthesia. There is no doubt that infected tonsils cause much general trouble as rheumatism, heart and kidney lesions, but I do not believe that all tonsils should be enucleated any more than that all appendices should be removed.

In conclusion I wish to impress two facts; First, that consultation with specialists should be frequently and early sought, when the most can be done for the patient. An imbedded cinder can be easily removed from the cornea and the eye probably be normal in a day or two. If the cinder is not removed promptly the resultant ulcer may destroy the eye. An acute case of catarrhal otitis media may be cured with comparative ease, while an old suppurating ear with marked destruction of the tympanic membrane is almost hopeless.

Second; the modern trend in eye, ear, nose and throat work is, as in general surgery, towards conservatism. Not so many mastoid operations either simple or radical are done as formerly; all tonsils are not being removed; a slight deviation of the nasal septum does not always require a submucous operation; the sinuses are not opened so frequently and the turbines are not removed because they sometimes swell.

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CORRESPONDENCE

THE MILITARY SURGEON is permitted to publish the following informal official correspondence omitting the name of the reporter, well known to the profession, and of the places reported upon, together with such matters as the censor would delete.

SOMEWHERE IN ENGLAND,
September, 1917.

"My experiences this month have been most varied and seem to include the whole range of British Medical Service, both as physician and patient. As a patient let it suffice to say that no treatment could have been more kind, sympathetic and generous than that which the authorities extended me.

"The General Hospital ——— is a typical British hospital of the base type, receiving the general run of surgical and medical cases of a non-infectious nature. The staff consists of four surgeons and five physicians, with a pathologist and the lieutenant colonel in command. The general rule is to keep patients here until temperatures are normal, wounds fairly clean, and sufficient strength is recovered to stand the channel crossing. I was placed in charge of two surgical wards and the work was most interesting. I was not there, however, long enough to make any observation other than that it seemed to me that wounds treated with B. I. P. paste did not do so well as those treated with some aqueous solution such as saline, Carrel-Dakin solution or eusol.

"The 8d ——— Field Ambulance was running a Corps Rest Station. Hither came the sick and malingering of a part of the corps. A great deal of "trench fever" or, as it is familiarly known, P. U. O. was evident. The malingerers feigned everything from insanity to gonorrhea. One man squirted condensed milk into his urethra to show a discharge which, of course, the microscope detected. Another diligently scrubbed the glans penis with a stiff brush in the darkness of night to produce chancres. He was detected by the orderly. The majority feigned after effects from trench fever. These are similar to influenza or grippe, and, being purely subjective, are difficult to detect when feigned. Many, too, had strained or sprained muscles or joints, the effect of which, being subjective, were hard to estimate. Any man suspected of malingering was kept in bed on a milk diet on a hard and uncomfortable stretcher. This was only done on consultation among ourselves. One feigning deafness was caught by an old trick. After seeing him the medical officer would say, "Poor fellow, he may have a bottle of stout and some chicken for his dinner," this in a very low tone. On the fourth day he complained bitterly because the officer's orders were not carried out.

"The sanitation of this camp is interesting. Frequent baths and changes of clothing were recommended to dispose of the ever-present louse. On admission every man, no matter what his temperature, was compelled to take a hot bath with sulphur soap. Whether the latter was efficient against the louse, I cannot say from my own observation. However, it was much lauded by those who used it. The patient's clothing was stuffed into a pillow-case by the patient,

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and this was taken to a Thresh sterilizer and subjected to steam under pressure for thirty minutes. Then the clothes were pressed with a very hot iron and such as needed washing were sent to the laundry. It is found that the eggs of the lice are very resistant, hence the need of pressing.

"Vast quantities of water had to be disposed of. As there were 600 beds in the outfit and daily admissions numbered sometimes as high as 60 but averaged 20, daily bathing and laundry work gave about 9,000 gallons to dispose of. Fortunately 20 feet below the ground surface was a layer of chalk. It was found that three pits 10 feet square and about 20 feet apart dug down to the chalk amply fulfilled the requirements. A certain proportion was evaporated by the cook-ranges and the incinerators, especially greasy cook and dish water. Deep pits also cared for the latrine refuse, they being built so far as patients were concerned over the pits.

"A scabies and impetigo hospital was also established some distance away. As my time was so limited I did not get to this place; it was being run by two medical officers independent of the Corps Rest Station. Sulphur-vapor baths are the most efficient cures for these conditions, I am told.

"The ——— Casualty Clearing Station is being used now almost entirely as a medical hospital and has mostly at present "P. U. O." cases. No treatment has been found as yet that is specific. Like influenza, it runs its course and one can only treat symptoms as they arise. Quinine gr. IV is used for temperatures above 101°, pulv. ipecac, et opii gr. X where suffering is evident. Aspirin gr. XX is used in a single dose daily as an empirical remedy for minor aches. The frequency of the dosage of the quinine and Dover's powder depends on each case's symptoms. A neighboring pathologist is at present doing an interesting search for the microörganism, which he believes is a spirilla, found in the blood during the exacerbations of temperature. He is at present endeavoring to secure the coöperation of a London laboratory which will demonstrate his theories. It seems likely that it is a parasitic disease conveyed largely by the louse."

. . . . . .

Writing from another place and speaking of the functioning of field ambulances, of which there are, normally, three to a division, and which, as is generally known, are divided into tent and transport sections, thus combining in one unit our field hospital and ambulance company, and part of the duty of which is to form the advance dressing station, the observer continues:

"At the A. D. S's the cases are sorted. A second ambulance acted as main corps dressing station. To this come all the slightly or moderately seriously wounded. The gassed cases and "shell-shocked" with no visible wounds, which may be malingering, were forwarded to a special casualty clearing station, which corresponds to our field hospitals, I take it.

"The serious, penetrating wounds of the skull, penetrating chest or abdominal wounds, fractures of the thigh are each referred to a special C. C. S. Why all fractures are not also referred to the last, I cannot say. It seems to me that it would be wise to have such field hospitals equipped with specialists in the individual line of work they take care of.

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"The third ambulance runs a rest-and-sick-camp, to which are referred the sick and those who are evidently done through overwork.

"There are several things I observed of a minor nature, which seem to me worthy of consideration. In the first place, our field dressings are white bandages. It is evident that white is a good target. British field dressings are khaki-colored bandages which allow a man, slightly wounded, to return to the line without a visible target attached to him.

The British also have wheel stretchers, which, on good roads in the back area, I should think, might be most useful. They consist of a pair of large wire wheels to which is attached a wooden platform, which has this theoretical disadvantage: If the bearer stumbles or falls for any reason, the stretcher upsets. This could be obviated, it seems to me, by a post attached, and by always seeing that the center of gravity is over the post end, much as a peddler's cart on the east side of New York City.

A third point is that I trust every American ambulance will be well supplied with bandage scissors. They would facilitate work greatly, if the British were as accustomed to them as we are. There also should be, I believe, a hypodermoclysis outfit with each ambulance. Several men could have been saved, I feel sure, who through shock and hemorrhage died on our hands.

When in rest, the ambulance acts as dispensary and field hospital for the sick of a brigade of the division. I have noticed among these there are a great many cases of a superficial infection of the skin and connective tissue, which begin much as furnicle and go on slowly breaking down, involving wider areas. Incision only shows a core of white necrotic tissue without pus. This necrotic tissue separates very slowly, leaving a slow-healing ulcer behind. These infections are frequently multiple, and occur on any surface, except the palms and soles. I find from inquiry that this state of affairs is very common, and the staphylococcus aurius is generally responsible. Why there is so little reaction to the infection remains a mystery to all. It seems to me that about one out of six reporting sick are victims of this peculiar trouble. Whether this malady is solely confined to the British "Tommy" I am not prepared to state, but I am told not. We have been trying the "Scarlet R" ointment lately, but it is too early to draw conclusions.

I suppose one of the greatest pests of summer time is the common house fly. Thanks to the poor domestic arrangement of these Flanders houses, there is always a large manure-pit in the center of the court yard of each farmhouse. In the field no attempt is made to bury horses which are killed. From such breeding places, the fly swarms so thickly as to be an absolute pest. Yet it is surprising to me that there are so few cases of the fly-blown illnesses.

In conclusion I wish to say that possibly these facts are trivial or already known, yet I consider it a part of our function to report what we observe.

AN OBSERVER.

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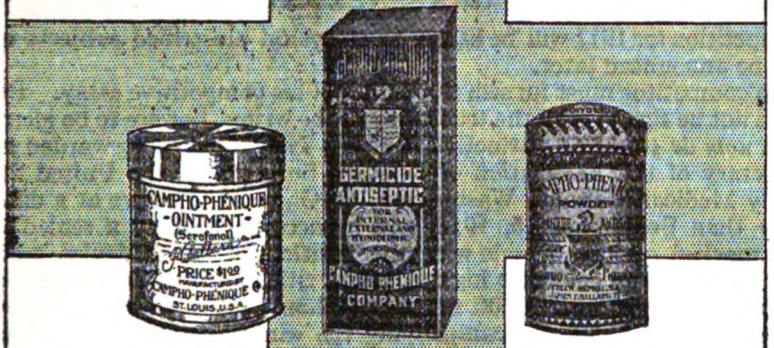

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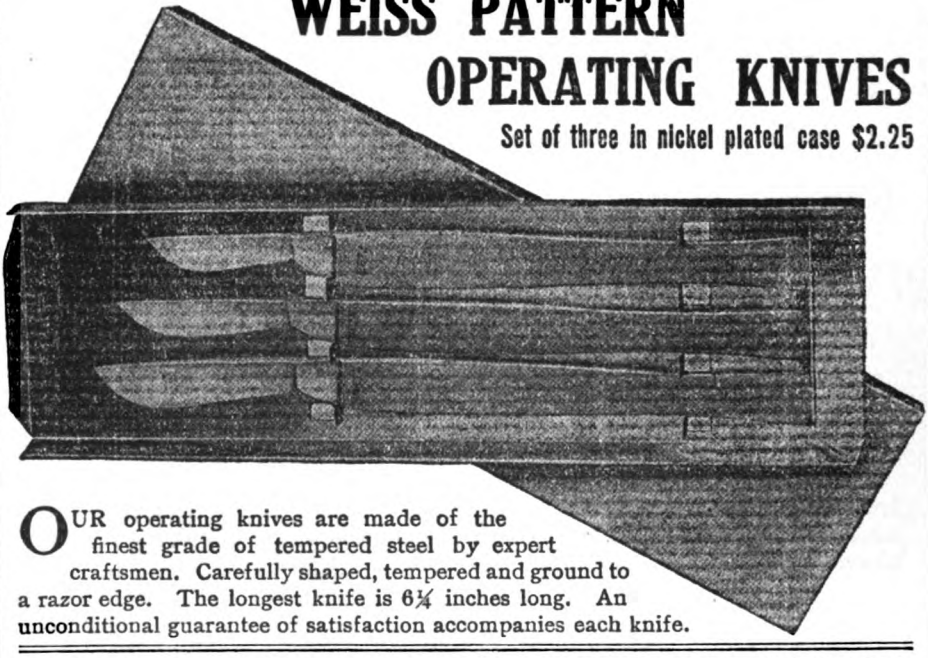

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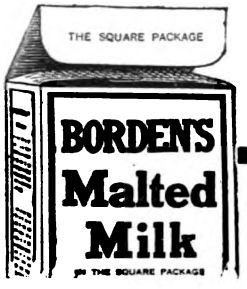

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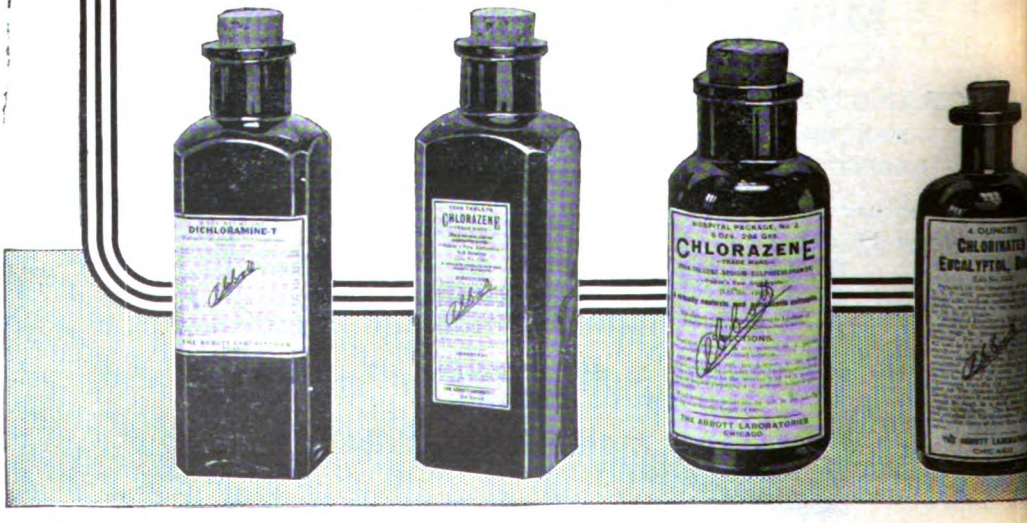

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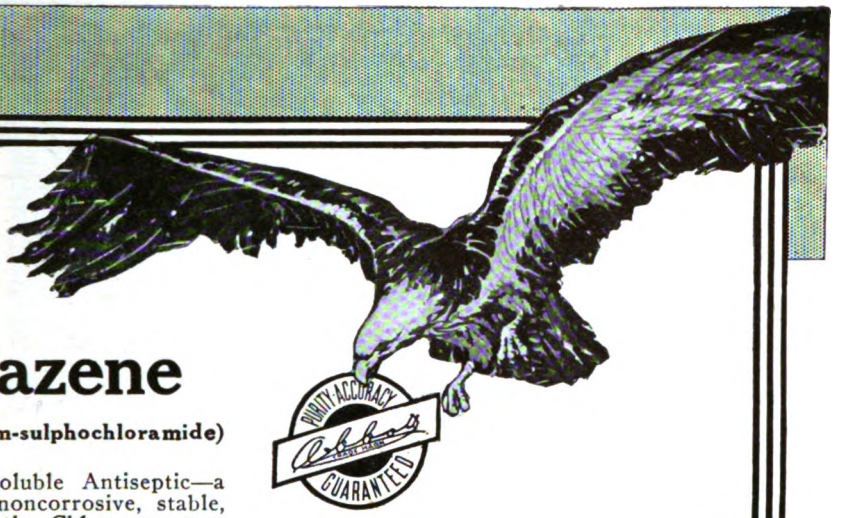

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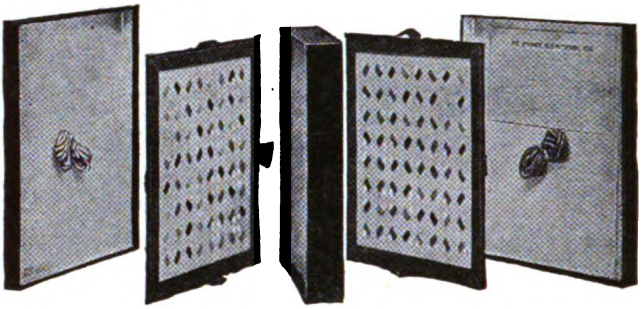

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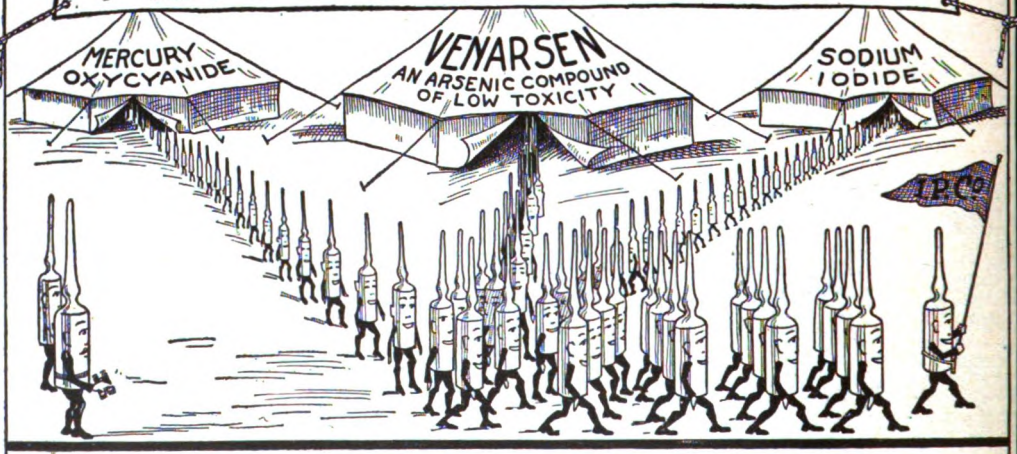

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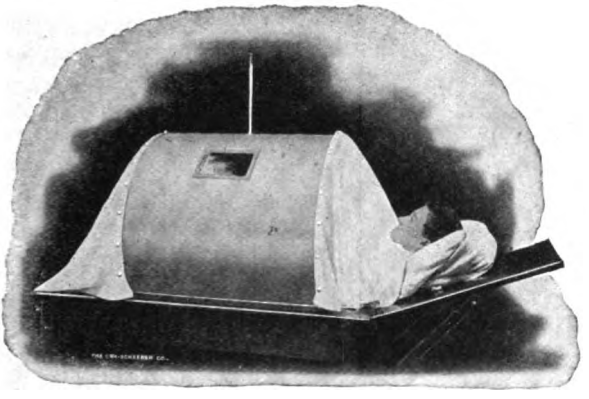

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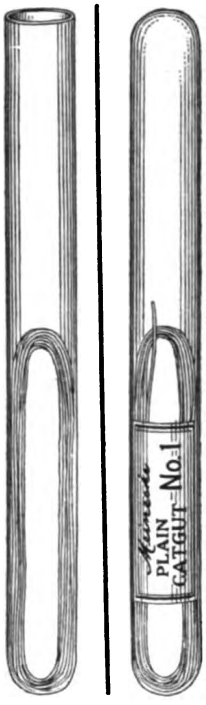

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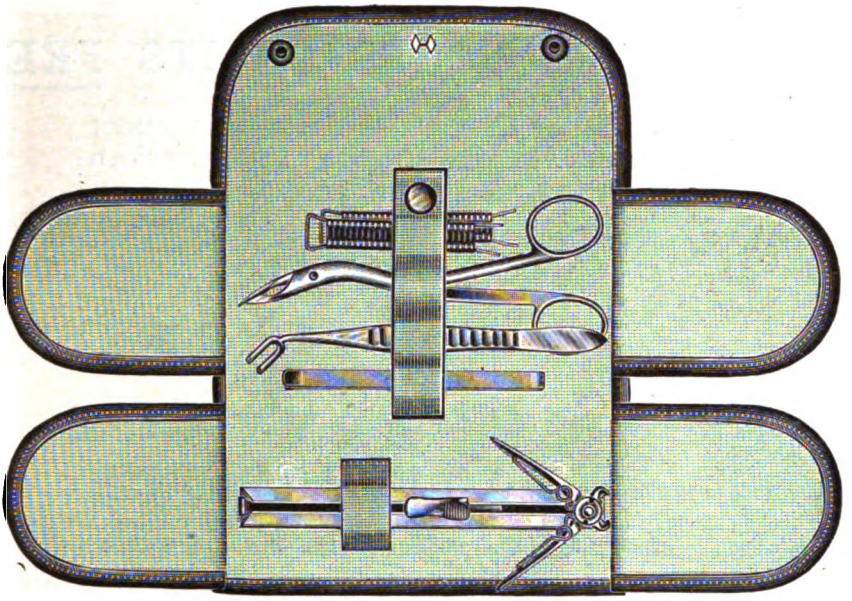

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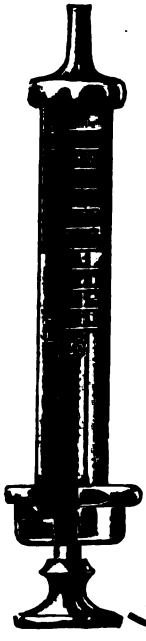

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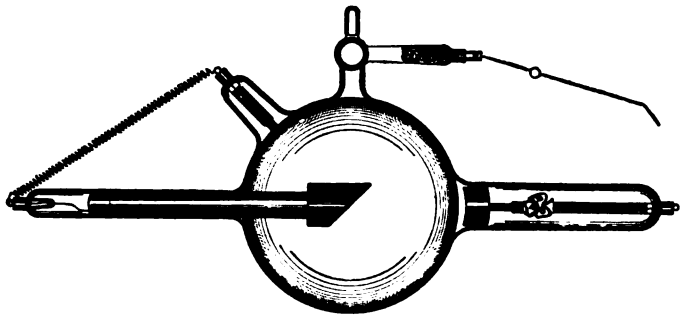

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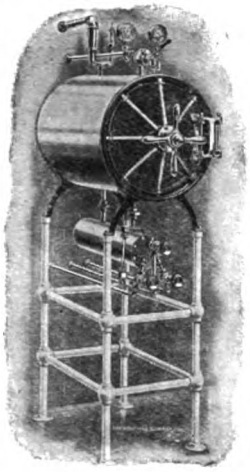

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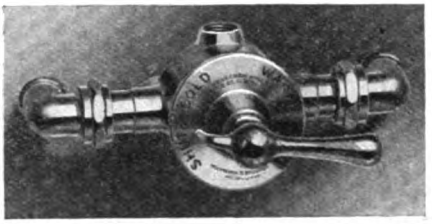

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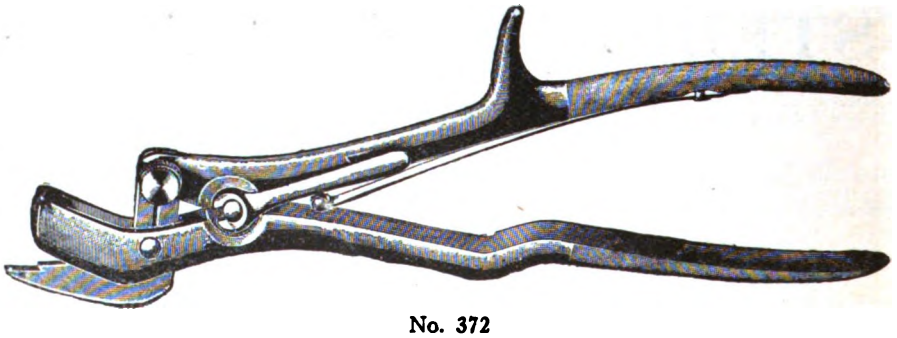

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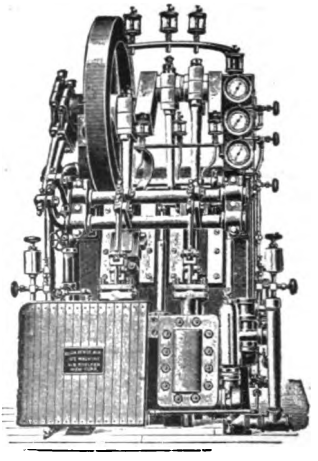

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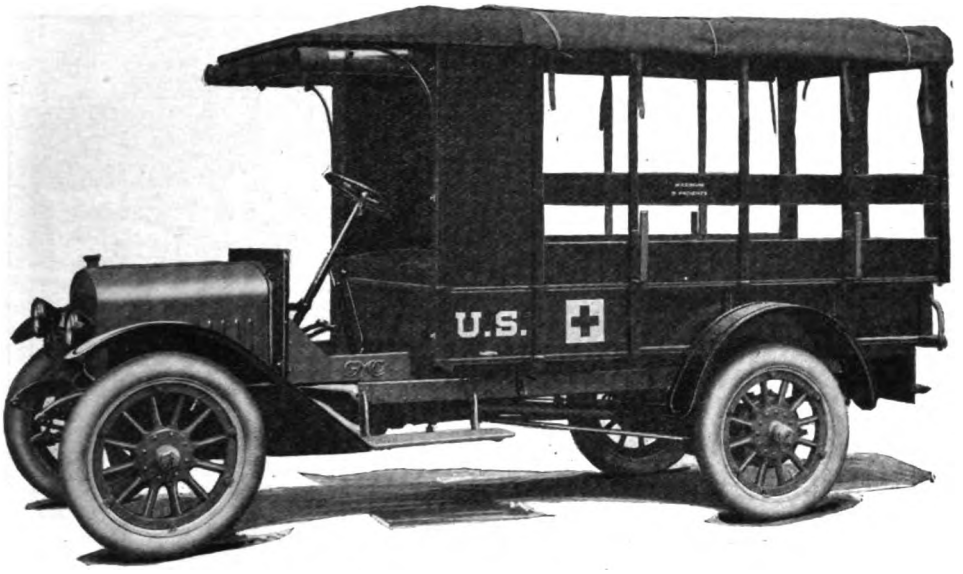

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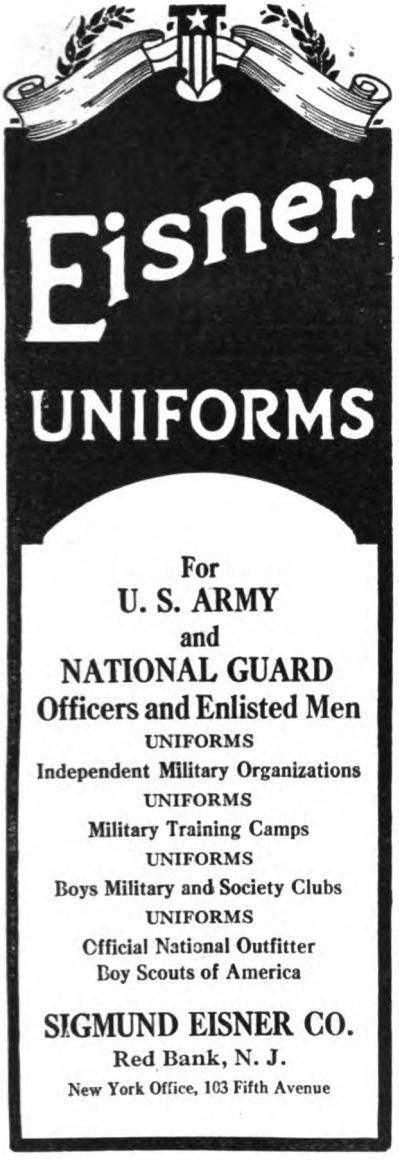

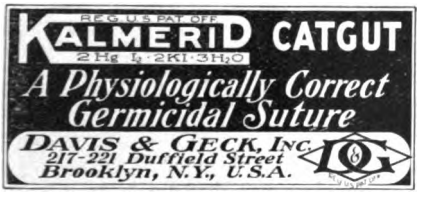

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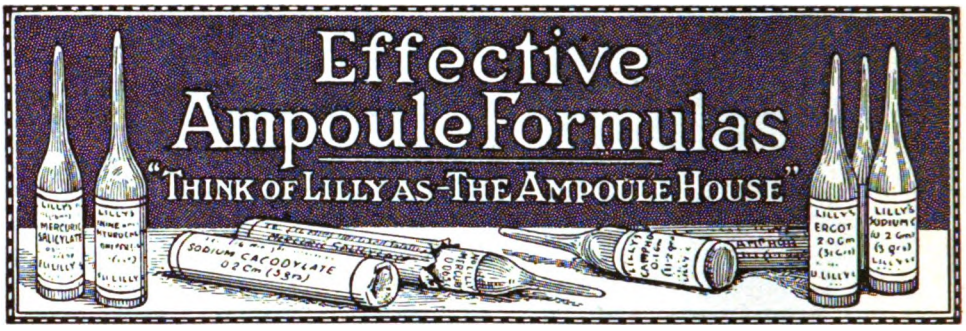

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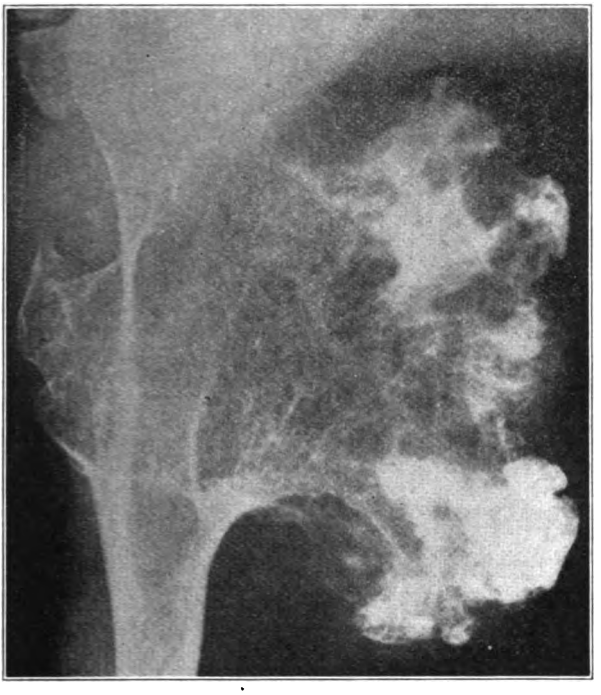

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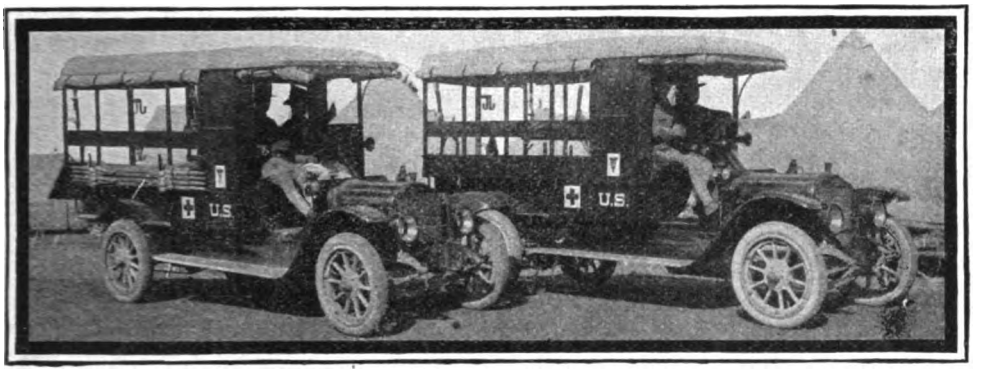

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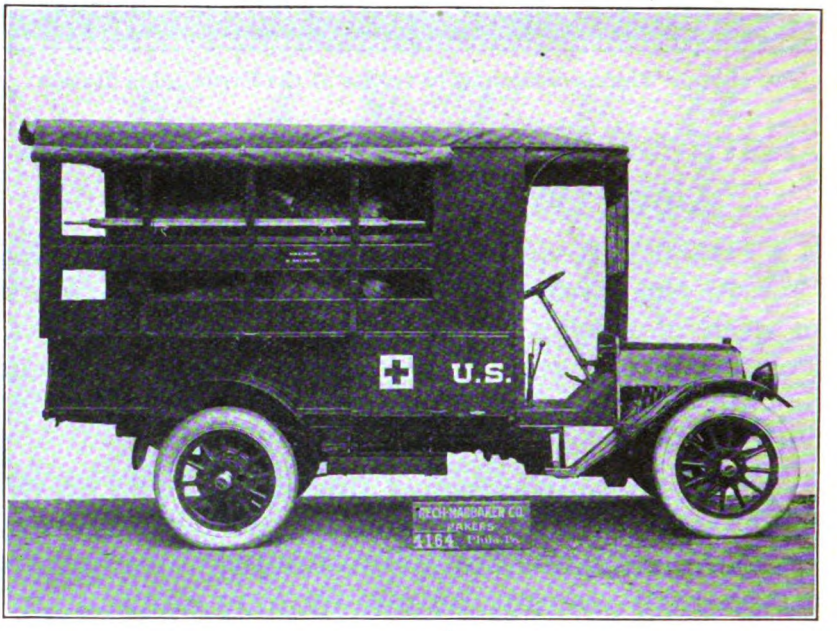

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THE
MILITARY SURGEON
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ORIGINAL ARTICLES

Authors alone are responsible for the opinions expressed in their contributions

AN EPIDEMIC OF MEASLES AND PNEUMONIA IN THE 31ST DIVISION, CAMP WHEELER, GA.

BY LIEUT. COLONEL LOUIS C. DUNCAN
Division Surgeon Medical Corps, United States Army

(One chart)

CAMP WHEELER, the camp of the National Guard Troops of Alabama, Georgia and Florida (31st Division National Guard) was opened at Macon, Georgia, on August 25, 1917. This was a real camp, tents being used for the men, and buildings for kitchens, dining rooms, baths, latrines and stables only. The camp was not completed until November. The first troops arrived on September 5 and by September 20 practically all the Militia were here, some 11,000 men. Of these probably 3,000 were recruits of about three months' service; the remainder had been in service more than a year.

Measles had existed in all the regiments from the time of their muster in (June, 1916), and most of the regiments had experienced considerable epidemics of both measles and pneumonia on the border during the winter of 1916-17. The Alabama troops had especially suffered at Nogales, Arizona. Nevertheless with careful measures the incidence of measles was held to a small stationary figure until October 21, when there were but twenty-two cases in the division. The total sick report was then less than 3 per cent. There had been, up to that time, eighteen cases of pneumonia, with no deaths.

On October 14 the first draft men arrived, about 4,000 coming at that time. Others continued to come, until by October 28 over 10,000 had arrived. These draft men brought measles on every train. Cases of measles were taken from trains where they had been shut up in closed cars filled with men for a few hours, or twenty-four hours or more. Six cases of measles were taken from one train.

It can scarcely be wondered at that measles got out of control among these men and among the recruits of the old regiments. The number of admissions for measles, which had been 7 on October 19, rose

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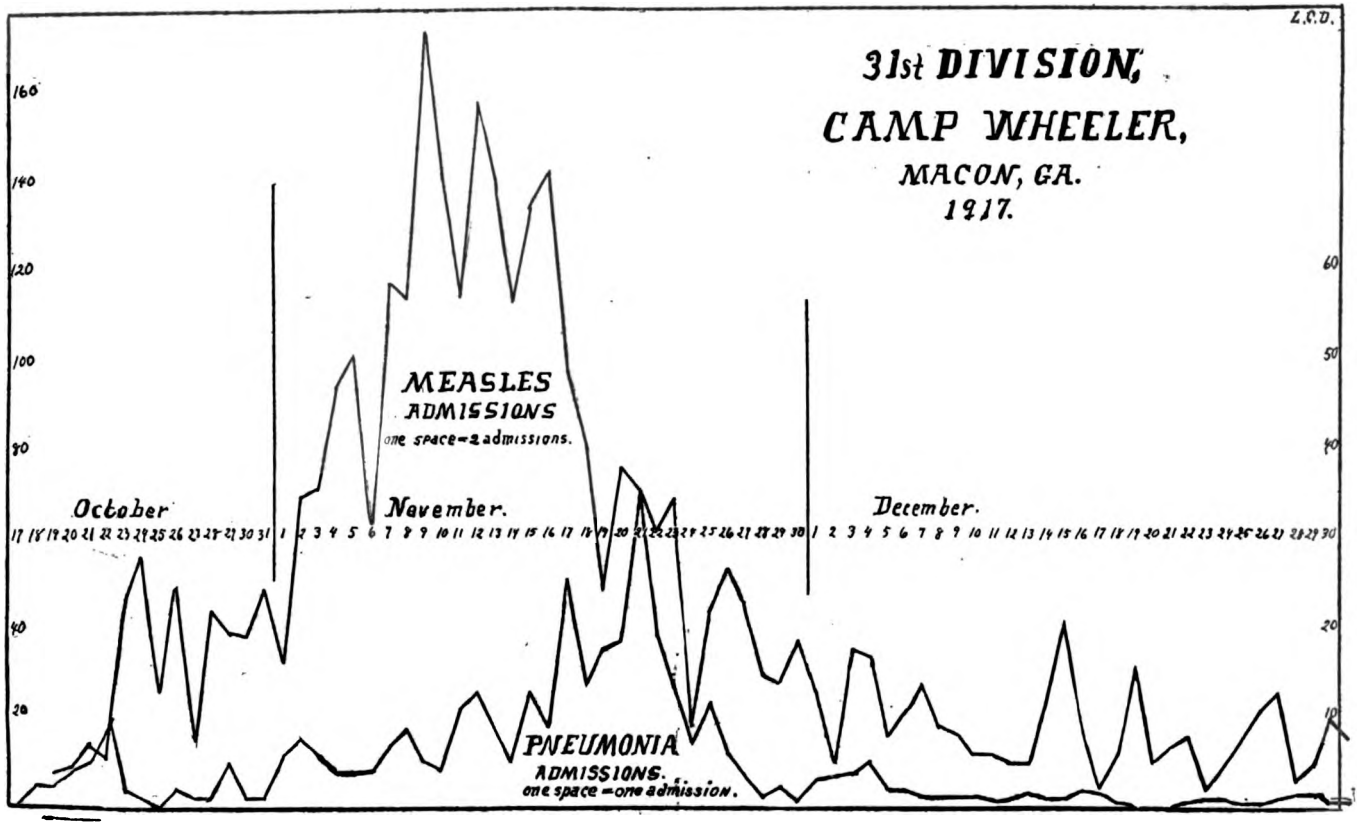

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to 14 on the 21st, 44 on the 23d, 70 on November 2, 102 on November 5, 118 on November 7; and reached its maximum with 175 admissions on November 22, 23 on November 25, and 1 on November 30. By December 7 the conflagration had burned entirely out. There were approximately 3,000 cases among the 10,000 draft men. It seems that there were about 30 per cent of non-immunes. This figure is worth remembering. A graphic chart of the measles admission gives a more clear mental picture than any words could. Very many of these cases were marked by severe respiratory complications: bronchitis, pharyngitis, tonsillitis, and laryngitis were extremely common, but there were practically no middle ear or mastoid complications. The one serious sequel was, as always, pneumonia; which grew to such proportions as to absorb all attention and obscure the lesser epidemic of measles with a vastly more serious epidemic of pneumonia.

It was at first thought that the pneumonia was to a considerable extent (70 per cent of cases) independent of measles. Fuller light and close study convinced me that the pneumonia was most intimately connected with the measles and, in fact, dependent on it. I do not see how anyone can study the combined chart of the two diseases, observe how the curve of pneumonia rose and fell regularly, not with but following the measles, and not see a relation of cause and effect.

The epidemic of measles began on October 21; the pneumonia epidemic began ten days later. On November 30, there was one pneumonia admission; on the 2d, 8; on the 8th, 9; on the 11th, 11; on the 15th, 13; on the 19th, 18; on the 20th, 10; and on November 21 the pneumonia epidemic reached its climax with 36 new cases reported. This is probably not exact, since a number of these cases had been admitted on previous days and were then first diagnosed. This was just twelve days after the measles climax; 175 cases on November 9. As with the measles, the decline was rapid. On November 23 there were 35 admissions; on the 26th, 28; on the 27th, 23; on the 30th, 19; on December 4, 17; on the 7th, 14; on the 9th, 8; and on December 12, 5.

The measles epidemic ended on December 7. The pneumonia epidemic may be said to have ended the last of December, 24 days later. The chart will again show the course of the epidemic more closely than any amount of writing. The manner in which the pneumonia curve follows the measles curve is more than accidental.

The causes of this epidemic and of all epidemics of pneumonia are fundamentally two: a predisposing cause, low vitality and an active cause, an infection. More than a year ago I had become convinced that pneumonia was an infectious disease, and when the first cases occurred on October 17, I ordered them isolated from all other cases in the field hospital. Major Loren Greene, 121st Ambulance Co., was then in

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charge of the camp hospital. Later developments, such as several cases from one tent (as many as five), the origin of many cases in hospital, and the work of the Rockefeller Institute, have convinced everyone concerned that pneumonia, especially measles pneumonia, is an infectious disease. The infection occurred in many ways, chiefly as follows:

1. Coughing and sneezing, especially in close and crowded places, was no doubt much the most important means of spreading the disease; in tents, in public places, and even in the hospital. In some cases the disease was probably conveyed through an intermediate carrier. An epidemic of coughs, colds and true influenza, preceded the measles, in Macon and later in the camp.

2. Crowding in tents was a contributing cause of infection. By orders nine men had been placed in each pyramidal tent, of 256 square feet floor. There was also crowding in the hospital for a time.

3. Dust may have been a factor in the spread of pneumonia. The camp in October was almost as dusty as the Texas border, the irritation in the throat being generally noticed. That there were some infections from the dust of tent floors is probable, though not proven.

4. Measles was, in my opinion, the greatest single factor in spreading the disease. It was more than a means—it prepared the soil, brought the pnuemonia susceptible together, and the severe bronchial cough of almost every pnuemonia case spread the seed broadcast in the air.

5. Carriers probably developed, though they did not carry the infection long.

The predisposing causes were also inportant; only slightly less so than the actual infective agent; they were:

1. A class of drafted men of most miserable physique, as noticed by all observers.

2. The men from the Gulf Coast did not withstand even the mild winter of central Georgia.

3. Many of the men suffered from the anemia of hookworm or malaria. Hookworm treatment was begun early, but chenopodium could not be procured in sufficient quantities.

4. There was, during November, an undeniable lack of warm clothing. Woolen, underclothes were not secured until the middle of November, overcoats not until later, about December 1. Stoves and fuel were also slow in arriving, as well as heaters for the showers.

5. Personally, I have no doubt there are a certain number of men who are especially susceptible to pneumonia. Measles was the greatest predisposing factor. It lowered the vitality; it caused severe bronchitis, giving the pneumococcus a ready lodgment; it seemed to render men especially susceptible, to produce a sort of anaphylaxis.

Causative Factors. Measles.—The relation of measles to pneu-

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monia is shown by the following studies of Major Zinsser and Lieutenant Barker.

1. From the records of the hospital and the regiments, a study of the relationship of measles to the pneumonia cases was made, based on 701 cases of pneumonia and 2,939 cases of measles.

	Per cent
Of 701 pneumonia cases, 389 did not have measles.....	55.49
and 312 were preceded by measles.....	44.51
Of the cases without measles 50 died.....	12.85
Of the cases with measles 93 died.....	29.8
Total mortality.....	20.39

Of 2,939 measles cases, 10.6 per cent developed pneumonia.

2. Since December 2 most of the pneumonia cases which have occurred have not had measles as a basis.

3. The chart submitted shows the time relationship of occurrence of measles and pneumonia and of pneumonia based on measles as related to those not based on measles.

4. It was attempted to find out whether or not the measles and pneumonia began in one part of the camp and thence spread gradually to other parts by contiguity. This was found not to be the case. The two diseases occurred in different parts of the camp at about one and the same time, showing thereby that a common factor present at the same time in different parts of the camp had to be considered.

5. The following tabulation shows the relative morbidity of measles and pneumonia and percentage per mean strength by command:

Command	Mean strength	Measles	Pneumonia	Deaths	Pneumonia morbidity	Deaths
					Per cent	*Per cent*
106th Eng.....	1,323	202	125	31	9.44	2.34
124th Inf.....	2,736	394	170	36	6.21	1.32
123d Inf.....	2,402	502	96	19	4.	.79
122d Inf.....	2,611	273	46	16	1.76	.61
121st Inf.....	2,427	481	73	23	3.01	.97
117th F. A.....	1,156	70	22	6	1.90	.52
116th F. A.....	1,231	55	28	4	2.24	.32
118th F. A.....	1,450	104	37	6	2.55	.41
116th M. G.....	510	39	14	0	2.75	0.00
117th M. G.[1]....	389	23	20	5	5.14	1.29
118th M. G.....	392	24	7	3	1.79	.77
106th Amm.....	658	76	13	2	1.98	.3
106th Sup. train.	368	10	6	1	1.63	.27
106th San. train[2]	698	8	6	1	.86	.14

[1] No measles record of 117th M. G. prior to November 1.
8th F. A., did not arrive in camps until November 10.
[2] Two cases not shown on regimental report of Sanitary Train were on duty at base hospital, there developed pneumonia, and both died.

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The main points of interest in this tabulation are the facts that there were certain regiments such as the 106th Engineers, the 124th Infantry, and 123d Infantry in which both measles and pneumonia seem to have been particularly concentrated, whereas other regiments adjacent to these were considerably less severely afflicted. It is worth while in this connection to consider the 106th Sanitary Train. This organization consists of 700 men, of whom 320 were National Guardsmen, the remainder being drafted men from Gordon and Pike. In the train there were 180 men from Alabama, 70 from Florida, and 70 from Georgia. As to contact with the sick, 82 of these men were nursing in the base hospital and 270 were occupied as ambulance drivers, in constant contact with the sick. They had only eight cases of measles and six cases of pneumonia.

The chief significant differences between 106th Sanitary Train and others was, as far as I could ascertain, relative isolation of the camp, lack of crowding in quarters, a rather better class, physically and mentally and the fact that they were supervised by 52 medical officers. However, the reason for their relative freedom from illness needs further analysis.

Contact Infections.—The following is quoted from Major Zinsser's report:

One of the purposes of the bacteriological part of our activities here was to attempt to determine in how far the contagiousness of pneumonia from case to case, or from carrier to case, could be based on actual observation at Camp Wheeler. For this purpose it was desirable to make a tent to tent survey of the pneumonia occurring in the various regiments, determining the number of instances in which more than one case had come out of the same tent. The result of this analysis in the 106th Engineers and the 124th Infantry, the two most infected regiments, has been submitted to you in the form of maps. These maps show a considerable number of cases coming from one and the same tent, and this in a company in which many tents furnished no cases whatever. In itself this is very significant, but it should be borne in mind that too sweeping conclusions should not be drawn from this, because type determinations on all of these cases were not available and we have discounted many of the earlier type determinations which showed type four. Also the maps do not discriminate between cases based on measles and those not based on measles, since this information was extremely hard to get at the time these maps were made. Nevertheless, it is a significant fact to be remembered in connection with further facts cited below, that two, three and more cases out of one tent are not uncommon. We thought that more light might be obtained upon the possibilities of contact infection by analyzing, tent by tent, those cases in which careful type determination had been made since our arrival. The results of this were somewhat disappointing, being as follows:

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124th Infantry:

Co. A. Five cases. One "type one," one "type two," one streptococcus with influenza, and one "type four" and one "type four" with influenza.
Co. B. One "type four."
Co. C. One "type two" and one streptococcus.
Co. D. One streptococcus.
Co. E. One streptococcus.
Co. F. One streptococcus, one "type four" and one "type one."
Co. G. One "type one."
Co. K. One "type two," one "type three," and streptococcus.
Co. L. Two "type four" not from the same tent.
M. G. One streptococcus.
Hdqrs. One "type four."

A similar analysis of the cases coming from the 121st, the 122d and 123d Infantry during the same period shows a similar scattering throughout the commands without apparent relationship. And though, as a regiment, the 124th showed a good many streptococci and the 123d showed a relatively large number of type two, this does not seem significant since they were scattered in different companies and, for our purposes, the company would appear to be the largest significant unit.

A regiment in which the study of the distribution of cases with regard to types seems to have been more fruitful is the 106th Engineers. In this regiment thirty-six cases occurred during the first sixteen days of December, on which type determinations could be made. A few of these cases were scattered in the headquarters company and the medical detachment, but the others fell into company groups and showed the following interesting condition.

Company A had seven cases, four of which were type one. Company B had six cases, four of which were type one and one of type two. Company C had five cases, three of which were type four. Company E had seven cases, four of which were type one, three of which were type two. Company F had six cases, three of which were type two and two of which type one; one did not develop an organism in the mouse.

The large number of similar types obtained from the same companies, during a short period, with a high pneumonia morbidity, was so striking that it seems worth while to further investigate tent distribution. Before describing this, however, it is worth mentioning that, from our observations on the close company associations of men in camp, the tent association is believed to be not much more important than company association, since the men, even if they do not sleep together, are constantly in touch with each other in company streets and at mess.

Nevertheless, the tent study was made and it was found that only in Company E were any of the cases with similar types associated in the same tent. In this company there were two men, both type one, in one tent, and three men, one a typical type two, a type two and a type one in the same tent. Two others,

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one a type one, the other a type two, were the only sick in their respective tents.

Since we still had a number of mice left, we thought it would be interesting to take twenty-five men from Company E who had not been sick, if possible, tent-mates or associates of the sick, and determine whether they were carriers of organisms similar to those which had caused the pneumonia in their company mates. This was done and the following interesting results obtained:

Of the twenty-five individuals so examined (we do not call them healthy because a good many of them had colds and coughs), one was a carrier of type one, one was a carrier of type two, two were carriers of a typical type two, one had streptococcus and influenza bacilli, two had streptococci, and the rest had either type four or showed no growth in the mouse.

It is further interesting to note that the type one carrier was in the same tent with one of the type one pneumonias and two of the type two pneumonias, and that the type two carrier was probably in the tent with one of the type two pneumonias, although this last information is somewhat uncertain, being elicited by questioning the men in the company street, but not on record.

This summary of Company E, during the short period of intense outbreak, furnishes some evidence of the probability that contact and carriers played a definite part in the transmission of the disease.

Relation of pneumonia to length of service is shown by the following table:

1 month	75	8 months	13
2 months	174	9 months	3
3 months	185	10 months	1
4 months	48	1–2 years	34
5 months	30	2–3 years	6
6 months	52	3–4 years	2
7 months	60	7 years	1
Total under 8 months	624	Total 8 months and over	60

The relation of pnuemonia to age is not so definitely shown, nor could it be, in that the number of all soldiers of the various ages is unknown. It appears that, after 25, susceptibility to pneumonia grows less.

The numbers of patients of various ages were as follows:

16 years	1	26 years	28
17 years	2	27 years	23
18 years	32	28 years	16
19 years	37	29 years	11
20 years	24	30 years	20
21 years	96	31 years	3
22 years	106	34 years	2
23 years	94	35 years	2
24 years	60	38 years	2
25 years	54	40 years	1

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As stated in the beginning, the soldiers of the 31st Division came from Alabama, Georgia and Florida. It was the general impression that the men from Florida suffered much more than the men from the other two states, due to the fact that they had made a considerable change of climate in coming to central Georgia. This change of climate might partly explain the greater prevalence of pneumonia in soldiers from the southern states.

The numbers of cases and states in which patients enlisted were as follows:

Florida	277	Pennsylvania	3	New York	2	Ohio	1
Georgia	178	Arkansas	2	South Carolina	2	Oklahoma	1
Alabama	172	Indiana	2	Missouri	1	Tennessee	1

This table does not show the real excess of pneumonia in the Florida troops; for, Florida has a smaller population than the other states and furnished little more than half as many men as Alabama or Georgia.

It was believed that the drafted men suffered more severely than the volunteers. This was true, but hardly in the proportion expected, while the numbers of these two classes were about equal, there were 273 cases among the volunteers and 391 cases among the drafted men. The proportion was 2½ per cent in the volunteers and 3½ per cent in the drafted men. The length of service was the real factor, of course, not the draft.

The number of men by states and by enlistment or draft was:

	N. G.	*Draft*	*Total*
Alabama	2,608	5,007	7,615
Georgia	5,067	4,100	9,167
Florida	3,316	1,412	4,728
Total	10,991	10,519	21,510

Florida had 277 cases among 4,728 men, or 5.9 per cent of command.
Alabama had 172 cases among 7,615 men, or 2.2 per cent of command.
Georgia had 178 cases among 9,167 men, or 1.9 per cent of command.

Preventive Measures.—The steady increase in the amount of pneumonia, and especially the increase in the number of deaths, with the numerous funeral processions through the streets of Macon, compelled, if compulsion were necessary, a united effort to search out and, if possible, find some means by which this fatal epidemic could be combatted. Gradually, aided by the Surgeon General, Colonel Fisher, Major Zinsser and the Sanitary Inspector, Major Turck, means were found which have at least greatly reduced the amount of pneumonia in the division. General Hayden was also of the greatest assistance. These means were as follows:

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1. A sufficient amount of woolen clothes, including overcoats and blankets, was secured.

2. Through the effective action of the Surgeon General sufficient tents were secured to place but five men in a tent, allowing 50 square feet of floor space per man.

3. Greater efforts were made to secure systematic furling of tents, and the keeping open of tent hoods and doors at night. A sentry was placed in each company street to enforce this order.

4. Tent floors were required to be mopped out daily with a 2 per cent creolin solution. Spit boxes, filled with sand wet with creolin solution and emptied daily, were required in each tent.

5. Mess kits were required to be boiled and the use of dish rags was not allowed.

6. Careful supervision of dental work was required, with sterilization of instruments by boiling.

7. Sterilizing rooms were constructed at the base hospitals and in all infirmaries, for sterilization of effects of pneumonia patients. Formalin and phenol were used in these.

8. Pneumonia convalescents were segregated and not returned to regiments, but later sent to Fort McPherson hospital.

9. The spraying of throats of convalescents with dichloramine T was required.

10. Measles patients were separated by screens in the hospital, and retained for a much longer time than previously.

11. From an early date, pneumonia patients were segregated in the base hospital and the types, as far as possible, separated, measles pneumonia being isolated from independent pneumonia.

12. Sprinklers were secured and a general system of road sprinkling was instituted, though at rather a late date.

13. The stopping of all gatherings was considered long and carefully, but never adopted.

14. Prophylactic vaccination was advised by me, as an experiment, but has not yet been tried.

Conclusions

1. Pneumonia is *the* disease of the camps of 1917-18. It occupies relatively the same place that typhoid did in the camps of 1898. It is killing hundreds and will render the morbidity and mortality rates of the Army little better than they were in that year. No other disease (except measles as a feeder to pneumonia) is of any importance compared with this captain of the men of death. Twenty per cent die (30 per cent of the measles pneumonia); at least 10 per cent more will have to be discharged; from two to three months are lost by each patient.

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Moreover, the hospitals are filled with sick who require the utmost of nursing, care, and medical attention.

2. For some reason not understood, the autumn of 1917 was peculiarly favorable to the development of pneumonia.

3. There is a large number of young men of military age, especially in the Gulf States, who are very susceptible to pneumonia. Poor physique, hookworm and malaria increase this susceptibility.

4. In addition to the above, attacks of measles and grip made many men susceptible and increased the susceptibility of others.

5. Pneumonia, like any other germ disease, is infectious. Coughing is the principal means of spread. All pneumonia patients should be segregated at once and kept segregated until no longer carriers of the germ. Practically the same sanitary measures are necessary as for meningitis.

6. When recruits from the southern states are mobilized in the summer time, it is advisable to allow measles to spread until all have had it. In the winter time measles will probably spread in any event.

7. Crowding of recruits is one of the most fruitful causes of spread. Overcoats are cheaper than coffins. Lumber is cheaper than lives.

8. The separation of pneumonia into types promises advances in treatment and prevention. It can hardly be said that it has actually accomplished much as yet.

9. The records do not show any marked advance in the treatment of pneumonia. The mortality is still 20 per cent as it was fifty years ago.

10. A prophylactic vaccination is highly desirable. It would save almost as many lives as has the typhoid prophylactic.

APPENDIX A

REPORT ON TREATMENT OF PNEUMONIA IN THE BASE HOSPITAL, CAMP WHEELER, GA.

Addendum to the Report of Lieut. Col. Louis C. Duncan, M. C., U. S. A.

By Major JOSEPH SAILER

Medical Reserve Corps, United States Army

The eight hundred cases of pneumonia that have been under treatment in the base hospital, have presented a variety of types and complications. This has necessitated the employment of methods that are more or less individual, nevertheless certain general principles have been followed, varying more or less according to the differing views of the successive chiefs of the medical staff.

On the whole it may be said that the care was better than the inadequate facilities would have seemed to render likely. These deficiencies

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were: the impossibility of heating the wards properly; the absence of plumbing; the difficulty of serving the food reasonably warm; the limitation of the supply of drugs; the untrained state of the orderlies when the epidemic commenced; the extreme over-crowding of the hospital, that has rarely had less than twice as many as it was built to accommodate, and sometimes more than thrice as many. Although there has been some improvement, the hospital is still inadequate to the needs of its patients. Undoubtedly, especially in the cases following measles, the prognosis was rendered less favorable by the unavoidable exposure to cold.

The treatment can best be considered under four heads: (1) specific treatment; (2) non-specific general treatment; (3) treatment of collapse and medical complications; (4) discovery and surgical treatment of empyema.

1. Only one form of specific treatment has been employed, the anti-pneumococcic serum for type one of the pneumococcic infection. This has been employed in about forty cases in which it was possible to obtain type determinations, and in eight cases in which type determinations were not made on account of the scarcity of mice. In the forty determined cases the mortality was about 10 per cent, slightly less than in the cases not preceded by measles, but not enough to convince us that the serum had any distinct curative effect. Aside from a few mild cases of serum disease, no injurious results were observed and, as a general rule, the temperature was lowered temporarily and the patient apparently benefited. It is justifiable to conclude that the serum is harmless, but there is, we believe, in this series no proof that it is specific. The eight cases without type determinations are interesting because the serum was used only when they appeared desperately ill and in the state called toxic. The serum was employed only because all other treatment had seemed ineffectual. All improved immediately after the injection and have continued to improve. Efforts have since been made to determine the type in these cases, but as yet unsuccessfully.

2. Under Major Weil all cases of pneumonia were given moderate doses of digitalis and tincture of nux vomica, about ten minims of each, three times daily. Under Major Halsey they were treated by large doses of digitalis according to the method of Cohn, about half a drahm being given three times daily until three or four drahms had been administered; it was then discontinued until signs of auricular fibrilation should appear, when the addition of a small amount of digitalis would control this condition. Under Major Sailer ward surgeons were permitted to use any rational treatment, and practically all used small amounts of strychnine and some saline expectorant, such as ammonium

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chloride. Codeine has been used throughout the epidemic to control pain and cough, and adhesive straps in those cases in which pleurisy was found or strongly suspected—a large proportion. Laxatives have been used moderately when indicated, not as a routine treatment.

3. The treatment of collapse and unfavorable complications has been vigorous, no case being regarded as hopeless until death occurred. The most common serious event has been edema of the lungs. This has been uniformly treated with large doses of atropine, occasionally as much as 1-50 of a grain being given hypodermically every hour. No instance of distinct physiological action of the drug has been observed, excepting the control of the edema, there has been no dilatation of the pupil, and rarely a slight sensation of dryness in the mouth . . . smaller doses have been continued for days. The rule has been to control the edema, if possible, no matter how much was required. Apparently some lives have been saved, and there has been no evidence of an injurious effect. The absence of a physiological response has led us to suspect that vagotonia plays a part in pulmonary edema. Next in frequency has been circulatory failure; this has been manifested in two ways, either as cyanosis or as a weak pulse and muttering delirium, the so-called toxic state. The treatment differed; for cyanosis with dilated right heart, venesection has been uniformly employed, sometimes assisted by a dry cupping. The effect has been prompt and decided. Temporary or permanent improvement has always followed and has been unmistakable. Morphine has also helped these cases.

For the second group, at first stimulation was employed, chiefly camphor, strychnine, caffeine and digitalis. There were no permanent results; all these cases died. Later proctoclysis with sodium bicarbonate and, when it could be obtained, glucose solution, were used, and seemed occasionally helpful. Hypodermoclysis was tried once, but did not seem to help. The case was desperate. Finally it was decided to use the serum and this has seemed, in eight cases, an efficient remedy. We shall continue to use it until a definite conclusion has been reached. In the type determined cases the serum was always used before the toxic state developed. The fatalities were due to other causes in these cases.

Prolonged delirium—that is, lasting more than three days—has been treated by spinal puncture; this has been satisfactory. There have been no unfavorable results.

Rarely the odor of acetone has been detected upon the breath. Owing to the deficiencies of the clinical laboratory, it has not been possible to test for ketonuria. For this condition sodium bicarbonate has been administered, without producing very definite results. The

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installation of ward laboratories will, it is hoped, render the detection of this condition more certain. Among the special surgical complications may be noted four cases of intramuscular abscess, one in the upper segment of the rectus, two in the lower segment of the rectus, and one in the gluteal muscle; all required incision, healed without incident, and the pneumococcus was found in the pus. Otitis media occasionally occurred and the course was mild.

There were several cases of pneumococcic meningitis, of which two recovered. The treatment was spinal puncture, and in two cases, known to be type one, the intraspinal injection of anti-pneumococcic serum; neither of these recovered, but were not apparently made worse by the injection. These will be made the subject of a separate report.

4. The management of the post pneumonic empyemas has been the most difficult problem presented by the pneumonia cases. It was soon determined that, if we relied wholly upon the physical signs, many of the cases would be overlooked, and gradually the following working system was evolved that has been fairly satisfactory, although not by any means perfect.

The pneumonia patients are divided into two classes, the suspicious and the non-suspicious. The former are reported daily and are subjected to a special examination, not only by the ward surgeon but also by a medical inspector or myself. The following features render a case suspicious; first, duration of fever for more than ten days; second, intermittent fever; third, return of fever after crisis or lysis; fourth, appearance of the physical signs of fluid; fifth, persistence of the physical signs of consolidation; sixth, localized distension of the cutaneous veins of the thorax.

On account of the inadequate equipment and personnel of the clinical laboratory, it was impossible to obtain daily leucocyte counts. A sudden rise in the leucocytes, could it have been determined, would be regarded as a suspicious sign.

If upon examination there seemed to be any sufficient reason, the patient was examined by the X-ray, either with the fluoroscope or by a plate, or both. If the suspicion were apparently confirmed, or a reasonable doubt existed, exploratory puncture was immediately done. The technique of the puncture was made as perfect as possible, the utmost cleanliness was observed, multiple punctures were not made on the same day, and after the needle was inserted it was not permitted to move the point about in the thorax. There have been no accidents. Every effort was made to discover or exclude the presence of pus in each case on the day that the case was first reported as suspicious

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but this was not always possible, and in several cases pus was found after three or four days. From the considerable amounts of pus found at operation, it was concluded, either that we are unable to detect small amounts or that the pus accumulates very rapidly. Probably both are correct. As soon as pus was found the patient was transferred to the surgical department for operation, often directly to the operating room. Altogether forty-five cases have had operation, of whom sixteen have died and one was returned to duty; twenty-eight are still under treatment. The high mortality has caused us much anxiety, and the surgeons are coöperating vigorously with us to discover the cause or causes and to overcome them. In addition four cases have been discovered at autopsy that had been missed, and two cases were in such desperate condition that no operation was attempted, and they died unrelieved. Altogether about 7 per cent of our cases of pneumonia have developed empyema, of whom nearly one-half have died, a very large proportion.

The most important factor in discovery of the empyemas has been the persistent alertness of the whole medical staff.

In a number of cases, not yet collated, clear fluid was found; this was always aspirated and, although a few of these cases subsequently developed empyema, so many recovered without operation that we are satisfied that this is good practice.

It may be interesting to note that three cases of pneumonia subsequently developed meningitis of the epidemic (meningicoccic) type. This is unusual and is now the subject of a special investigation by Captain Wilson, the director of the laboratory.

There were four cases of digitalis heart block, all of whom recovered promptly, and no cases of arythmia that might have suggested auricular fibrilation.

The management of the convalescent patients has been a most difficult problem. The overcrowded condition of the wards made it necessary to discharge patients somewhat earlier than is usual, particularly during the epidemic of measles and mumps. Unquestionably this has been injurious and helped to increase the incidence of pneumonia. The convalescent pneumonias presented another problem. They were not able to return to duty nor were there suitable quarters in the hospital for their care. The difficulty was finally solved by transferring them to the hospital at Fort McPherson. This transfer is proceeding steadily. The results appear to be favorable, but cannot yet be finally determined.

January 1, 1918.

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APPENDIX B

DIVISION SURGEON'S OFFICE.
HEADQUARTERS THIRTY-FIRST DIVISION.
CAMP WHEELER, GA.

CIRCULAR NO. 12. *December 4, 1917.*

PNEUMONIA

Pneumonia is an infectious disease, conveyed by means of saliva and mucus from the respiratory organs. The disease may be communicated directly by contact, indirectly by a carrier, or by dust containing the cocci. The following measures are to be carried out:

1. The surgeon should see that all regulations for the ventilation of tents by keeping hoods and doors open are enforced.

2. The floors must be scrubbed daily, with 2 per cent creolin, or its equivalent, when possible. No dry sweeping should be allowed.

3. Spit boxes must be kept in all tents, containing sand wet with creolin solution, and emptied daily. The company streets must also be kept clean.

4. The tents must be furled on all clear days, and kept furled for not less than six hours.

5. Not more than five men are allowed in a tent, and the heads of the men must be as far apart as possible, 5 feet being the minimum.

6. The surgeon should keep a record of all cases of pneumonia and a plot showing the location by tents. Infected tents should be given special attention. Names of patients may be procured at the Division Surgeon's office.

7. Bedding and clothing of measles and pneumonia patients will be disinfected as soon as disinfecting rooms are ready at the infirmaries. Beds should be sunned well.

8. Chenopodium will be given all men who have not yet had it.

LOUIS C. DUNCAN,
Lieut. Col., Med. Corps, Division Surgeon.

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THE DISPOSITION OF PATIENTS AND CANDIDATES FOR ENLISTMENT WHO PRESENT SYMPTOMS AND SIGNS OF HEART DISEASE

By Major JOHN M. SWAN
Medical Reserve Corps, United States Army

THE determination of the efficiency for military duty of men who present the subjective symptoms and physical signs of the various forms of cardiac disease is no easy matter. Recruiting officers are often unable to decide whether a candidate who presents a murmur will or will not be able to stand the strain of active service, and ward surgeons are often unable to decide whether a patient who complains of cardiac symptoms is complaining on account of a functional disturbance or because of serious organic disease.

During the Civil War, Da Costa, to his own satisfaction and that of nearly everybody else, described the irritable heart of soldiers as a clinical entity and showed that its treatment by digitalis was satisfactory. During the present war, the question of the interpretation of cardiac signs and symptoms has been prominent; so prominent, in fact, that it has been thought wise by the Medical Research Committee, working under the direction of the National Health Insurance of Great Britain, to devote special attention to the cases of soldiers returned as cases of "Disordered Action of the Heart" (D. A. H.), or "Valvular Disease of the Heart" (V. D. H.). For the purpose of the study and treatment of these cases, a military hospital (Hampstead) was set aside and a staff of specially trained observers assigned to it in order "to provide for the invaliding out of the service of men with permanent disease unfitting them for further duty and for the treatment by appropriate means of a very large group of cases of uncertain nature."

The following are the important symptoms of which these patients complain: breathlessness, pain, exhaustion, giddiness and fainting. Breathlessness is often constant and is increased by exercise or by emotion; sometimes it is experienced while at rest and occasionally it is paroxysmal. Pain is frequent and varies in degree from precordial discomfort to that suggestive of true angina. Giddiness is almost constant and is associated with change of posture and with effort. Palpitation of the heart, headache, lassitude, excessive sweating, coldness of the hands and feet, irritability of temper, sleeplessness, inability to fix the attention, shakiness and flushing are less important symptoms. The physical signs include increased heart rate, an exaggerated response of the systolic blood pressure to emotion and to effort, deficiency of

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force of the apex beat, irregularity of the heart's action, occasional slight rises of temperature, increased respiratory rate, hyperacidity of the urine, with the presence of phosphates and calcium oxalate crystals, and a moderate leukocytosis chiefly affecting the lymphocytes.

The report made for the active staff of this hospital, by Dr. Thomas Lewis, is the basis of this paper. It summarizes the careful study of about 1,000 soldiers. When these soldiers were received at the hospital they were first passed through a preliminary sorting and were divided into two groups: (1) those who were unfit for further service, and (2) those who required more careful study.

Those unfit for further service include cases in which the symptoms are due to the existence of pulmonary tuberculosis or frank exophthalmic goiter; those in which there are unmistakable signs of mitral stenosis, aortic regurgitation, aneurysm, grave forms of cardiac irregularity, and cases in which there is an appreciable displacement of the heart's apex to the left.

The opinion expressed in this report concerning the value of cardiac murmurs in the determination of the fitness of a soldier for duty is worthy of reproduction. The report says, "Auscultation is the least valuable method employed in sorting soldiers suffering from cardio-vascular derangements. The sorting can almost always be effected without its aid." The characteristic, low-pitched, rumbling, presystolic murmur at the apex and the diastolic murmur heard with maximum intensity at the base of the heart and associated with a water-hammer pulse are indicative of mitral stenosis and aortic regurgitation respectively. Systolic murmurs, on the other hand, whether heard at the base or at the apex, in the absence of other disqualifying signs, may be entirely neglected. These murmurs, in the experience of this committee, indicate valvular disease exceptionally. The extent of mitral valve damage sufficient to produce a systolic murmur is relatively slight. The disease is often limited to the valve; the heart muscle, which is the essential part of the organ, being wholly undamaged. Patients who are invalided on the ground of systolic murmurs alone are found, when tested, to be fit for active service in nearly all instances. A large number of men who present such murmurs are known to have passed the more severe ordeals of active service without accident. At the same time, if a group of patients who present no murmurs and a similar group in whom systolic murmurs exist are tested in respect of their capacity for work or active service, no difference will be found in the two groups.

As a result of this study, the committee finds that an appreciable increase of dulness to the left of the sternum and a strong impulse beyond the nipple line are the most satisfactory guides to enlargement of the heart.

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Intermittence of the pulse or simple and regular groupings of pulse beats (respiratory arrhythmia) should not be interpreted as physical signs of heart disease; they would not incapacitate the person in whom they exist. "The only irregularity of consequence in soldiers is a persistent irregularity of a very disorderly type which does not disappear when the heart is accelerated during or immediately after exercise" (auricular fibrillation).

The following statements seem to the writer to be so important that they are quoted at length:

> The fear of overlooking early heart disease and the widely felt difficulty of its diagnosis are chiefly responsible for hesitancy in dealing with the men, and for blunders in classing them for duty and discharge. Here, again, actual experience is the only safe guide. It may be taken as an axiom that no soldier who is free from symptoms on duty, has an affection of the heart which incapacitates him, and this axiom may be adopted irrespective of any unusual sign found in the heart. Now actual heart disease in young soldiers, in the absence of a history of rheumatic fever or of syphilis, is a comparative rarity. Where there is a history of rheumatic fever, and especially when symptoms date from rheumatic fever, the question of diagnosing a heart lesion need only rarely arise; for, whether it exists or not, the history and symptoms alone will almost always declare incapacity; it is a matter of experience that these men rarely return to active service and, if there is return, the subsequent stays in hospital will very greatly outweigh the duration of duty performed. In regard to syphilis, it is remarkable that amongst those who exhibit signs and symptoms of the syndrome considered, a history of syphilis or a positive complement fixation test is very rare. Venereal disease generally, like alcoholism, is conspicuous by its absence from the histories of these soldiers. When the first sorting has been accomplished upon the lines indicated, any further attempt to diagnose organic disease of valves or muscle should not be attempted for, if attempted, it will in the best of hands prove unprofitable; in inexpert hands it will often prove disastrous.

After eliminating the patients received in hospitals who present conditions described in the preceding paragraph, a second sorting is made of the patients and the following are marked as unfit for duty of any except the sedentary type: (1) Those in whom the onset of the symptoms dates from the occurrence of an attack of rheumatic fever, or in whom there have been recurrent attacks of rheumatic fever. In this class of cases, of course, a distinction must be made between genuine acute articular rheumatism and attacks of joint and muscular pain, not due to acute rheumatism. (2) Those in whom dyspnea on exertion has been tested objectively and found to be persistently severe. (3) Those in whom precordial pain repeatedly prevents exercise and is associated with hyperalgesia of the cardiac skin areas. (4) Those in whom the heart rate is persistently 120 and over, even when lying down. (5)

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Those in whom an exercise test such as walking up a flight of thirty steps produces an anxious expression, a respiratory rate of thirty-five or more, which does not disappear when the patient lies down, or a pulse rate which fails to fall within five beats of the preexercise level after lying down for two minutes. (6) Those in whom the symptoms are of moderate severity, but of many year's duration. This class includes men who gave up games at school or left heavy work in civil life on account of symptoms.

The cases remaining after the exclusion of those indicated above are then tested out by means of graded exercises. The report gives five sets of calisthenic exercises, beginning with very mild movements lasting fifteen minutes, gradually increasing until a group of energetic movements lasting thirty minutes is employed. When sorting the patients by this method, it is wise, in speaking in their presence, not to use terms which would draw attention to the heart. All such terms as valvular heart disease, disordered action of the heart, soldier's heart, athlete's heart, heart strain, and irritable heart should be carefully avoided. The term "effort syndrome" is suggested as being a satisfactory designation for the patients under consideration.

The exercises referred to above may be given without fear of ill consequences. The same exercises that are used for sorting the cases are also employed therapeutically. Rest in bed is harmful and should be avoided, except in cases attended with severe precordial pain, severe headache or severe giddiness.

Continual rest in bed is undesirable in any circumstances. The inclination of many of these soldiers is to stay in bed; it should be discouraged. Many are of neurotic temperament and self-abuse is by no means unknown amongst them. Occupation is clearly called for, not only upon this ground, but on the wider ground that it controls introspection which is prevalent. Briefly, these soldiers should be treated primarily as convalescents; they should be encouraged to stay much in the open air and should be given light employments, such as gardening; they should be given to understand not only that their condition is curable, but that improvement is visible. At the first interview, there should be no lingering over the examination of the heart; in no instance should any suggestion be made that the heart is in any way affected. Much good can be accomplished by stating, wherever possible, as each organ is examined, that it is sound.

It has been clearly shown that tobacco increases the resting pulse rate and exaggerates the rise of pulse rate and symptoms induced by exercise in these patients. A number of drugs have been shown, by carefully controlled observation, to be without material effect upon the condition. Digitalis is without influence upon the symptoms, and its use should be discarded; the only soldiers in whom this drug has a real value are unfit

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to remain in the service. Bromides may be of service in the initial stages; in the later stages they are of no avail.

The most successful methods at present available are the well-known hygienic methods and graduated exercise. Exercises have been adopted at many hospitals in England, and with very gratifying results. They serve the double purpose of sorting doubtful cases into several categories for service and improving the capacity for work.

To one familiar with the various manifestations of disturbance of the endocrin system, the symptoms and physical signs, manifested by those patients who are not excluded as suffering from organic heart disease, must suggest that the condition so long known as "the irritable heart of soldiers" and now to be called, if the recommendations of this very able committee are adopted, "effort syndrome," is dependent upon disturbance of the thyroid or other ductless glands. The committee has considered this possibility and has discarded it. They say that the onus of proof rests with those who put forward this hypothesis. In 483 of their cases the thyroid gland showed no enlargement; in nineteen cases there was some demonstrable enlargement; in fifteen, the enlargement was doubtful. They do not consider that rapid heart action, palpitation, flushing, tremor and moist skin are sufficient to warrant the conclusion that the endocrin system is affected, because the same signs are frequently present in convalescents from acute infections. They say, "the question of hyperthyroidism is capable of a direct test, namely, the tolerance or intolerance of these patients to thyroid administration. A large number of observations have been conducted from this point of view and others are in progress. So far as they have been taken, they are opposed to the view that there is an unusual tolerance to the extract of thyroid."

They also consider the possibility of the condition being dependent upon myocardial disease. They conclude that "while the possible presence of early myocardial change in certain of these patients remains undecided and is even deemed probable, it is very improbable that such lesions play much part in producing the symptoms in the group as a whole." They also discard the hypothesis of a bacteremia and of toxemia as the cause of the condition, although it is possible that both of these conditions may be coexistent.

One of the first considerations in the treatment of these cases is the removal of foci of local infection—the extraction of carious teeth, the removal of septic tonsils, the cleansing of the mouth by antiseptic washes, and the removal of a chronically inflamed appendix. I would suggest the following conclusions for the guidance of recruiting officers and ward surgeons: (1) A candidate for enlistment who presents definite

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evidence of mitral stenosis, aortic regurgitation, aneurysm or hypertrophy of the heart should be rejected. (2) A candidate who presents an apex systolic murmur, transmitted into the axilla and heard at the angle of the scapula, accompanied by definite evidence of cardiac hypertrophy and subjective symptoms, should be rejected. (3) A candidate who presents an apex or a basal systolic murmur of irregular transmission, not accompanied with cardiac hypertrophy, and unattended, except occasionally, with subjective symptoms, should be accepted. It is altogether likely that such a candidate, under regular out-of-doors life with systematic muscular exercise, would prove satisfactory material for the development of a good soldier. (4) A candidate who presents an extra-systolic arrhythmia or a respiratory arrhythmia should be accepted, provided there is no evidence of organic heart disease. (5) A candidate who presents a pulsus irregularis perpetuus (auricular fibrillation) should be rejected. (6) Cases of functional cardiac disease which have, in the past, been termed irritable heart of soldiers, etc., should not be treated as cardiac cases. They should not receive digitalis. They should not be kept in bed. They should be employed at tasks which require a gradually increasing expenditure of muscular effort. Calisthenics should form a part of their treatment. (7) Candidates for enlistment who give a history of syphilis and of recurring attacks of rheumatic fever should be rejected.

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THE EFFECTS OF HIGH ALTITUDES UPON THE EFFICIENCY OF AVIATORS

By Major E. G. SEIBERT
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IT IS a well-established fact that pilots show marked evidences of nerve breakdown or instability in greater or less time, according to the individual. Earlier in the war this was attributed to the stress of circumstance. Observation, however, developed the fact that there was a more potent underlying cause, which, by a great amount of patient investigation, was shown to be largely due to the decreased quantity of oxygen going into the blood.

As the war progressed, the altitudes to which pilots were forced to go became greater and greater, and these evidences became progressively more and more pronounced. Today, altitudes are commonly reached on the fighting front which were, before the war began, only rarely attained. Now, because of the increased range of anti-aircraft guns, altitudes of 20,000 feet and over are necessary for much of the fighting and scouting, and are commonly reached in the day's work.

Inasmuch as the reasons why these evidences of nerve instability are a matter of altered physiology, it may be well, before further discussing the subject, to call attention to some of the fundamental facts of the physiology of respiration.

The term *respiration* is usually applied to the intake and output of air from the lungs. As a matter of fact, however, respiration further implies the gaseous interchange in that terminal portion of the bronchial tree known as the air cells or alveoli; the taking up of oxygen into the blood in loose combination with the hemoglobin; the carrying of the oxyhemoglobin to the peripheral tissues and giving up oxygen to oxidize or burn up muscular and other tissues, furnishing heat and power, and giving to all the body processes those phenomena which constitute life. This is, in brief, the full summing up of the term *respiration*.

It is well to keep these facts constantly in mind, for, if you do, you will readily appreciate all those happenings, which, it will appear, are manifest when the oxygen is reduced, and which cause those symptoms that are generally known as oxygen want.

The percentage of oxygen in the atmosphere remains constant, irrespective of the height. The partial pressure, or tension, however, varies and diminishes in a somewhat progressively proportional manner with the decrease in barometric pressure. It is the oxygen tension in the air cells of the lungs which is most important in maintaining the respiratory process.

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The following table shows the decrease of barometric pressure and oxygen tension with the increase in elevation:

TABLE SHOWING RELATION OF BAROMETRIC PRESSURE AND OXYGEN TENSION TO ELEVATION

Feet	*Barometer*	*Oxygen tension*
0	760	101.32
10,570	520	51.09
12,200	490	44.81
14,000	460	38.53
15,200	440	34.34
16,500	420	30.16
17,900	400	25.97
18,600	390	23.88
20,050	370	19.69
21,000	...	17.3

As the transfer of oxygen from the alveolar air to the blood depends, in part, upon the oxygen tension, it can readily be seen why oxygen want should promptly ensue on reaching high altitudes.

One other factor in this transfer of the oxygen to the blood is the activity of the alveolar epithelium, or cells lining the alveoli. This introduces the individual factor into the question and explains why some may go to these heights with less symptoms resulting than others. There is certainly just as much individual difference in the alveolar epithelium as there is in the color of hair or eyes. It is believed by many that acclimatization, or the acquired ability to withstand high altitudes, is brought about by the improved efficiency of the alveolar epithelium. It may be said, in passing, that this point of acclimatization has been studied by the British Air Board without any satisfactory results, as yet.

In altitudes above 16,000 feet, where the barometric pressure is half the sea-level pressure and the oxygen tension reduced to one-fourth or less, the blood is quickly deprived of the necessary oxygen to carry on the body processes, and allows of the accumulation of those substances which, sooner or later, bring on pronounced intoxication. This intoxication is particularly marked in the nervous system. Its effects are peculiar, and, unfortunately, this peculiarity is especially dangerous to the aviator.

Haldane, professor of physiology of Oxford University, states that extraordinary impairment of judgment is extremely characteristic and the person himself is totally unaware of it and quite confident that his mind is absolutely clear. In a position of danger a man may fail to

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take the necessary measures for the safety of himself and those with him, even when he is well aware of the danger. Perception is more affected than sensation; one sees things without understanding them properly. It is hard, for instance, to make a barometric reading. Misjudgment of position of things is also pronounced.

Other effects are, as reported by aviators themselves: panting, difficulty in concentrating attention, headache and fatigue after landing, vertigo, vomiting, noises and pains in the ears. Many other symptoms of this intoxication have been noted and reported. Different individuals show marked variation in their susceptibility to low oxygen, but in very many cases these effects are more or less constant. For instance, in a series of thirty-five pilots examined by Capt. Martin Flack of the British Air Board, the following extracts are noted:

No. 1 (28 hours). Giddy above 4,000 feet.

No. 2 (10½ hours). Giddiness and blurring of vision when flying at 6,000 feet.

No. 3 (140 hours). Fainted twice in air above 8,000 feet.

No. 11 (300 hours). Since crash, fainted twice in air at 8,000 feet and 10,000 feet.

No. 13 (50 hours). Headache and compression and tending to dizziness above 3,000 feet.

No. 31 (400 hours). At first all right, then on three occasions faint at 7,000 feet.

No. 32 (14 months). Flying every day for fourteen months. At first all right to 12,000 feet. Now giddy at 5,000 feet.

No. 35. At first all right at 6,000 feet, but progressively uneasy at heights.

In the method of ground investigation followed by the English Board, the experimental altitude corresponds almost exactly in symptoms produced with those of the actual altitudes above noted.

Professor Henderson was associated with Douglas, Haldane and Schneider in the Pikes Peak expedition to study the effects of high altitudes. The results of this expedition, where low oxygen effects were studied on many individuals, demonstrate the fact that men differ widely in their susceptibility to low oxygen.

Unfortunately, prime physical fitness is not always a guarantee that the subject will be free from these symptoms of nerve instability. The Pikes Peak expedition showed that many men ordinarily classed as physically fit, men who had excelled in athletic work, were readily affected by that altitude—14,100 feet—and in a short time on the Peak exhibited such evidence of the effect of oxygen want that, in the aviator, would surely lead to disaster were he to be called upon to exercise his judgment, alertness or decision.

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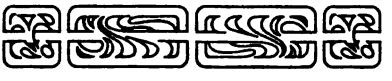
This fact of individual susceptibility points very clearly to the necessity for selection of the men who have been in training for overseas work. It would be manifestly a great risk to send a man up for scout work when it could be shown that an altitude of 16,000 feet would bring on in him conditions that would interfere, to say the least, with the full performance of all his activities.

These reasons seem to demand selection for scout and fighting work of the flying officers for the spring program. This board has planned an examination particularly designed to disclose the facts above set forth. The large number of men to be sent would make it impossible for all to be examined. Because of this, the board has recommended to the chief signal officer that selection for scout work be made by the commanding officers of flying schools of those deemed best fitted therefor by general observation. This selection should develop quite a large number of men. From these, selection should again be made by the examination methods proposed by the board.

This examination practically eliminates guesswork. The method pursued will be arrived at after careful and painstaking scientific investigation. Every means will be taken to safeguard the efficiency of this examination by careful calculation and the application of all known methods of investigation, so that, when our aviators are finally sent to the front, it will be the belief that they represent the finest and best that our country has to offer.



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A STUDY OF THE AEROBIC BACTERIA FOUND IN WOUNDS RECEIVED ON THE BATTLEFIELD OF THE SOMME

By First Lieutenant JOSEPH S. LAWRENCE, M. R. C., U. S. A.
Bacteriologist for the American Ambulance, Neuilly, France, Summer, 1916

THE purpose of this paper is to give the American surgeon and bacteriologist an idea of the types of organisms that contaminate gunshot wounds made on the western front, their relative frequency and importance and simple methods for their identification. The material was collected in the summer of 1916 from wounds inflicted on all parts of the body and received about Peronne at the time of the English and French drive. About 1,500 wounds were studied culturally, and more than 5,000 stained preparations were examined from July until ovember. A collection of fifty specimens taken at the first examination of wounds, containing, among other contaminants, aerobic sporebearing organisms, were brought back to America and studied carefully in the laboratory of Johns Hopkins Medical School. A brief survey will be made of the sources of contamination, the methods employed in a base hospital laboratory, the types of aerobic organisms encountered and their significance to the surgeon.

A knowledge of the sources of contamination is important. Every wound will be contaminated sooner or later, while the vast majority are infected at the time of making. Bullet wounds made at short range may re ıain sterile if they are not compound fractures, but a bullet wound made from a long range will be almost as badly torn as a wound made by a shell fragment. Most of the wounds, however, are made by pieces of exploded shells.

These pieces vary in size from several square inches in area to particles as small as a pin head and, while they in themselves may be sterile, yet because of their ragged nature, wherever they strike a part covered by clothing they take shreds of it into the wound. These shreds of clothing are the source of most prolific bacterial growth, while the tissue torn from its blood supply and necrosing, furnishes the best of medium. The body of a trench dweller is inhabited by a varied and extensive flora, so that unless the wound is dressed in less than six hours it will be infected from the skin. Wounds of the face are infected as early as those of the body, but because this tissue is highly vascular and these wounds are shallow and drain easily, their infection is not usually of such desperate character.

Another source of infection may be the dressing. The first-aid band-

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age, if used, may be contaminated while being applied, or instead of a first-aid bandage a handkerchief or some part of the clothing may be employed to stop the hemorrhage. The earliest dressings made by the surgeons must of necessity be very crude, for there is little time to spend on technique. The water used to wash the wound may contain contaminating organisms. One evening seven patients arrived at the American Ambulance who had been wounded at different sections of the front and, while being transported to the rear, were dressed several times before they reached the base hospital. A bacteriological examination of their wounds showed them all to be contaminated with the same aerobic sporebearer. Inquiry into their histories revealed that they had all come together at Amiens, where they were last dressed. The source of this infection was never determined, but it is quite possible the spores were in the water used in washing the wounds. The time of the year, to a certain degree, determines the type of infection. In the winter the pneumococcus, micrococcus catarrhalis and diphtheroid organisms are more commonly found in the wounds than they are in summer. The location of the battlefield is a factor to be considered. In the lowlands of Flanders the tetanus bacillus and *B. welchi* are almost universal. On the mountains about Goritzia there were no cases of gas infection, but in the valleys of the same front it was quite common to some of the surgeons of the Italian army.

The procedure for making the bacteriological examination of wounds was about as follows: At the earliest dressing made after the entrance of the wounded to the hospital a sterile cotton swab, such as is used in taking throat cultures, was brushed over the part of the wound where the discharge was most abundant. These swabs, incased in sterile glass tubes, were sent to the laboratory and there kept in the refrigerator until evening. In the regular routine work but three media were used: nutrient broth, plain agar slants and glucose agar tubes for deep growths. The glucose agar was boiled for ten minutes to remove the air and then quickly cooled to 42° C. The swab was first immersed in the broth, then stroked over the agar slant and finally shaken vigorously in the melted glucose agar. This tube was immediately put into a bath of ice water so as to congeal it instantaneously.[1]

The cultures were incubated over night and examined the next morning. Films were made from the broth and the slant agar. If gas

[1] When gas gangrene was suspected the routine was changed slightly. The regular three cultures were made, as soon as the specimen was taken from the wound, and put into the thermostat at once. Gas rarely developed in less than twelve to eighteen hours, but if the swab on which the specimen was collected was replaced in the glass tube, after seeding the media, and this incased in a larger tube with a solution of pyrogallic acid and sodium hydroxide, thus producing anaerobic conditions, and then incubated for four hours, the presence of *B. welchi* could be demonstrated morphologically by brushing the swab over a clean glass slide and staining the film by the gram method. This saving of time was of the utmost importance in many instances.

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developed in the glucose agar, the tube was broken below the surface of the agar and a smear made with the fluid that was found along the side or in the bottom of the tube. If there was no gas present, then the tube was broken opposite to one of the deep colonies and a film made of it. Our method of breaking the tube was to scratch it with a piece of carborundum or a file and then to touch this scratch with a piece of glass rod heated to white heat. By this method we secured films that were not contaminated by the surface growth. These films, having been stained by the gram method, were examined under the oil immersion lens. This was not an elaborate bacteriological investigation, but at the time it served to guide the surgeon who wanted to know as early as possible of the presence of the gas bacillus or streptococci. These were considered the particularly dangerous organisms that could be isolated and when their presence was accompanied by clinical symptoms, immediate surgical attention was imperative.

The microscopical findings were often hastily reported as streptococci, staphylococci or gram negative or gram positive bacilli. The great mass of organisms were micrococci, both gram negative and gram positive, and gram negative bacilli of the colon-proteus group. In more than 80 per cent of the wounds studied culturally, streptococci (cocci appearing in chains of four or more units) were found. In the deep or pocketed wounds the streptococci flourished, but in the shallow wounds, or when the deep pockets were opened wide, they were replaced by staphylococci in the course of healing. Gram negative and gram positive varieties of both streptococci and staphylococci were observed. Varying degrees of anaerobiasis were manifested in the deep cultures examined after twenty-four hours' growth.

Sometimes the streptococci grew on or near the surface of the glucose agar, at other times there was a ring of growth about two centimeters from the surface, and again the most luxuriant growth might be in the very depth of the tube. A study of the micrococci was begun in the ambulance but had to be discontinued because of the great amount of time required for routine work. The pneumococcus, *M. catarrhalis*, *M. tetragenous* and enterococcus, in addition to *M. aureus* and *M. albus*. were recognized, but we could go no further without the assistance of special media.

Morphological studies of smears made directly from the wounds convinced us that not all of the organisms contaminating the wounds were growing out on the culture media. We felt the advisability of making such study of morphology a part of our routine, and when the Carrel procedure was introduced to the wards and smears made from each wound every third day for the purpose of counting the microbes,

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an opportunity was given to study morphologically the flora of all wounds. Thus the initial contamination could be studied as well as the time during the treatment when certain types of organisms would disappear, or, perhaps, new contaminats be introduced. Micrococci were always present in contaminated wounds, the initial morphological examination showed streptococci, diplococci and staphylococci in abundance. The streptococci soon disappeared, as a rule, and the staphylococci gradually grew irregular in size and fewer in number until finally they disappeared and only an occasional gram positive coccus or diplococcus persisted. When these were very few their presence was ignored by the surgeon when plastic work was considered and the wound treated as though bacteriologically sterile.

Gram negative bacilli, usually of the typhoid-colon size but occasionally some that were larger, were present in 95 per cent of the wounds. The larger forms disappeared pro nptly under treatment, but the smaller forms persisted for a longer or shorter period, especially if the wound was imperfectly irrigated, but would finally totally disappear. Culturally, these gram negative bacilli proved to be types which ordinarily abound in the alimentary tract.[1] The following organisms were isolated in pure culture with the frequency indicated. *B. coli* was found in more than 50 per cent of the wounds. The two types, one fermenting saccharose and the other not, were found in equal abundance. *B. vulgaris* was found in about 40 per cent of the wounds, *B. aerogenes* and *B. pseudo dysentericus*, (Müller, 1902) were isolated from about 25 per cent of the wounds.

B. cloacae, *B. rhinoscleroma*, and *B. alcaligenes* were each isolated from 10 per cent to 20 per cent of the wounds.

B. pyocyaneus was isolated from only about 10 per cent of the wounds while they were still fresh, but as the wounds grew older it was found more frequently.

Larger bacilli, both gram negative and gram positive, were observed in about 20 per cent of the wounds and, when cultured, proved frequently to be aerobic spore bearing organisms. Of these the following varieties were isolated. Arranged in the order of their frequency, they are: *B. cereus*, *B. mesentericus*, *B. vulgatus*, *B. subtilis*, *B. fusiformus*, *B. albolactus*, *B. aterrimus*, *B. megatherium*, *B. brevis*, *B. terminalis* and *B. circulans*. These organisms usually disappeared very promptly from wounds under treatment.

Other gram positive bacilli, but non-sporebearing, were very like *B. diphtheriae* in morphology. These organisms were more prevalent in the winter than in the summer.

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[1] Ford, W. W. Studies from the Royal Victoria Hospital, Montreal, 1903. Classification and distribution of the Intestinal Bacteria found in Man.

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The significance of the presence of these aerobes is becoming more apparent as the study and care of wounds progress. Their presence in the first place indicates contimanation and the impracticability of closing the wound. The presence of a few *M. albus* in the exudate is not necessarily a contraindication to closing the wound, but they must not be more plentiful in the testing films than an average of one for each two oil immersion fields. The persistence of aerobes in the exudate indicates an unirrigated discharging sinus or a hidden foreign body. The type of aerobe changes as the wound ages. At first there are *M. aureus* and *M. albus* and streptococci with *B. coli* or *B. vulgaris*, but as the wound improves the streptococci are eliminated, first from the surface and lastly from the depths, especially when the bone is involved. Finally, *B. pyocyaneus* appears while the other bacilli are banished.

The presence and persistence of the aerobic sporebearing organisms are interesting. They share, with the other aerobic contaminants, the human intestine as habitat, and so perhaps are normally present on the skin and clothing of a trench dweller. They do not appear to be wholly benign when found in combination with strepotococci or some anaerobes. Wounds contaminated with *B. fusiformis* or *B. brevis* do very badly when deep, where anaerobes can act conjointly with the aerobic sporebearers. They sometimes sporulate while in the wounds and morphologically may resemble certain anaerobic spore-forming organisms. On one occasion a very severe compound fracture of the arm was observed to do exceptionally well as long as the contamination was confined to *B. cereeus* and *M. albus*.

The presence of these aerobic organisms may have no significance whatever in a shallow flesh wound, while in a deep wound or a compound fracture they may aid greatly in producing proper conditions for the development of anaerobes. They attack albumen slowly, but will destroy it completely, and while they do not produce toxic conditions as rapidly as many of the anaerobes, yet they do produce a definite intoxication. Some of the spore-forming organisms, as *B. vulgatus*, produce hemolysins. These observations indicate that

(*a*) The type of contamination may vary with the location of the battlefield, with the time of the year, with the age of the wound and with the care exercised in making the dressings.

(*b*) The contaminating organisms are saprophytes or parasites from the air or intestinal tract.

(*c*) They are mostly non-pathogenic, but, when exceptionally situated, may produce toxic conditions.

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THE RELATION BETWEEN THE AMPUTATION AND THE FITTING OF THE ARTIFICIAL LIMB

OFFICE OF THE SURGEON GENERAL, U. S. ARMY
The Division of Military Orthopaedic Surgery

(Three illustrations)

THE AMPUTATION

LITTLE attention has been given by surgeons to the fitting of artificial limbs. As a rule the surgeon rarely sees his patient after the healing of the wound, but turns him over, usually without supervision, to the care of the artificial limb maker. Hence the surgeon loses one of the most valuable means of control in the perfection of his technic and frequently errs in comparatively simple details which a knowledge of the fundamental points of the artificial limb maker's art would enable him to avoid. It seems wise, therefore, to call attention to those points in the technic of amputations which have a direct bearing on the fitting and wearing of a substitute.

In war, as is well known, amputations must usually be performed under conditions which exceed the most adverse in civil life. During an active engagement decisions must be quickly made: the wounded are suffering from shock and often from exhaustion, and the chances of infection are multiplied to the highest degree.

The questions of when to amputate, at what point it should be done, what type of amputation should be chosen and whether the incision can with safety be closed are obviously matters of the most vital importance to the individual and also determine whether his after-care and the fitting of the artificial limb are to be easy or difficult. It is admitted that in the first months of the war, when conditions were particularly unfavorable and infection ran rampant, amputations were sometimes performed carelessly and stumps left open that could with safety have been closed.

The question of amputation is, therefore, one of the most serious problems the army surgeon must face and one that calls particularly for calmness under stress and for the exercise of the most sound surgical judgment. When the requirements necessary to conserve the safety of the patient have been met, the sole remaining consideration is to be given to securing the stump which will best meet the demands made upon it by the artificial limb.

END-BEARING STUMPS

The importance of securing an end-bearing stump in the lower extremity is not sufficiently recognized. The usefulness of a success-

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ful Syme, Pirogoff or Gritti-Stokes has long been known. Yet with these exceptions artificial legs are designed by the makers to take the weight on the ischial tuberosity when the amputation is above the knee, and laterally on the tuberosities of the tibia when it is below, and little or no attempt at end-bearing is made. The possibility of securing an end-bearing stump in a large proportion of cases has, however, been clearly demonstrated,[1] and it is highly desirable that the surgeon and the artificial limb-maker should coöperate to achieve it; for it is obvious that the transference of even a part of the weight to the end of the stump will conduce to greater comfort and improved function.

The chief responsibility rests, however, upon the surgeon, since the prerequisites for end-bearing are a good stump and early functional use. "The best formed stump, if not quickly put to use as a real support, may become atrophied and useless" (Lyle).

The experience at Roehampton as to the proportion of cases capable of some end-bearing is shown in the following table, given by Little:

Cases Fitted with End-bearing Pad

Upper third of thigh	2 out of	22 =	9 per cent
Middle third of thigh	75 out of	235 =	32 per cent
Lower third of thigh	63 out of	81 =	77 per cent
Through the knee-joint	5 out of	6 =	83 per cent
Upper third of leg	42 out of	74 =	56 per cent
Middle third of leg	64 out of	98 =	65 per cent
Lower third of leg	6 out of	14 =	43 per cent
Syme's amputation	12 out of	14 =	86 per cent

Three Stokes-Gritti and two Pirogoff's amputations were all capable of bearing weight on the end of the stump.

RELATION TO TECHNIC OF AMPUTATION

It is apparent that the choice of procedure in the various steps of amputation will depend on (1) the presence or probability of infection, (2) the general condition of the patient and (3) the local circumstances under which the operation is to be performed.

When all conditions are favorable, that technic may be chosen in each step which experience has shown is likely to give the most useful stump. This is one in which—(1) the scar is so placed as not to be exposed to pressure, (2) the soft parts are sufficiently voluminous to be freely movable over the end of the bone but not redundant, (3) the divided muscles and fascia are united over the bone end, (4) the nerve ends are not hypersensitive, and (5) the end of the bone is smooth and rounded.

[1] Lyle, H. H. M.: *Jour. A. M. A.*, Vol. xviii, 1914, p. 1149.
Little, E. M., *Brit. Med. Jour.*, October 27, 1917, p. 550.

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In *the presence or probability of infection*, long flaps are contraindicated because of the lowered resistance following the impairment of circulation incident to their formation. Hence it is recommended by the Inter-allied Surgical Conference[2] that "amputation for infection should be flapless or with short flaps held apart." Furthermore, it is obvious that the periosteum and bone should be treated in the simplest manner possible—by transverse division in the same plane.

Flapless (so-called Guillotine) Amputation.[3]—This method has obtained considerable favor as it seems to possess sufficient advantages in severely infected cases to recommend it over the usual flap operations:

1. It lessens shock by (*a*) shortening the time of operation and (*b*) permitting amputation at the lowest possible level.

2. It decreases the danger from infection by (*a*) exposing the least possible extent of raw surface and (*b*) avoiding the impairment of the circulation incident to the formation of flaps.

3. It is also said to lessen the risk of secondary hemorrhage.

Its indications are stated to be gaseous gangrene and certain cases of compound comminuted fracture and of multiple wounds.

"The skin and deep fascia are divided, usually in circular fashion, but sometimes more skin may be gained by making the incision oblique; after retraction has occurred, the muscles are divided at the level of the retracted skin—not too quickly so as to allow a retraction of the layers; then the bone is sawn flush with the muscle; vessels are secured and nerves carefully shortened."

If the operation has been properly performed, the surface is at first slightly concave, but soon becomes convex from further retraction. This must be overcome by extension. (For method see "Stump Extension.")

Re-amputation is, of course, necessary. This may consist only of the removal with the Gigli saw of the necessary length of bone, or one of the typical flap operations may be performed. (It has been stated by others, however, that it is often possible to perform a secondary suture after four or five days.)

A poor general condition of the patient also demands that simplification of technic which will ensure the least shock; this does not, however, contraindicate the use of flaps, although in regulating their size the possible effect of the lowered general resistance on infection should be borne in mind.

Unfavorable local circumstances, as poor facilities or stress under the "peak load," also render advisable a similar simplification of technic.

With these restrictions, the following points of technic are emphasized as of particular importance in the formation of a suitable stump:

Placement of Scar.—In the leg "amputation by circular incision results in terminal cicatrices which have every defect of situation, shape

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[2] *The Medical Bulletin:* Pub. by Am. Red Cross Soc. in France. Vol. i, November, 1917, No. 1, p. 11.
[3] Kelly, M. Fitzmaurice: *Brit. Jour. Surg.*, April 16, 1916, p. 676.

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and adherence; on this point all surgeons are agreed."[4] When flaps are not contraindicated, therefore, they should be made of unequal length so that the resulting scar will fall where the terminal and lateral surfaces meet.

In the arm pressure is exerted laterally and not on the end of the stump, hence here the scar, with the exception to be noted, should be terminal. Amputation by the circular method or by short, equal antero-posterior flaps is therefore preferable, except in the case of the wrist, where a palmar flap gives an excellent stump.

When the incision is left open, whether the circular method be used or the one with short flaps, extension must very soon be applied to the skin to overcome retraction and thus limit the size of the resulting scar. (For method see "Stump Extension.")

Attention to Soft Parts.—The comfort with which the appliance is worn and the freedom with which it is used are influenced to no small degree by the condition of the terminal soft parts. Adherence of the skin to the bone is most undesirable and is a frequent cause of reamputation.

For this reason it is desirable, whenever possible, to suture the muscles and the deep fascia. Silk should not be used. The tissues should be of sufficient bulk to move freely over the end of the bone. Redundancy should, however, be avoided as in this case the skin is apt to become excoriated from rubbing against the walls of the socket.

Treatment of the Nerve Ends.—Pain in the stump is one of the most common annoyances of the amputated and in a large percentage of cases is due to trouble with the ends of the nerves. In every amputation, therefore, the greatest pains should be taken in the division of the nerves. The nerve should be drawn down strongly, out of its sheath, and an inch or more removed. Various additions to the technic have been suggested to still further protect against overgrowth of the end: a modification of the fish-tail method of Ritter (Fig. 1) is recommended as meeting the indications most simply and effectively.

Treatment of the Bone.—To meet the requirements of the artificial limb, especially if end-bearing is sought, the bone must be smooth and rounded. Recent studies in the processes of osteogenesis indicate how this may be secured. Viewed in the light of what these studies have taught, it is obvious that the common method (periosteal) of treating the bone is objectionable. In this method the periosteum is first peeled back and then drawn down again over the sawn end of the bone. This necessarily results in more or less shredding of the periosteum and consequent bony overgrowth, the very condition it is desired to avoid. When

[4] Tuffier: *Brit. Jour. Surg.*, Vol. iv, 1916, p. 422.

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the indications call for the simplest effective technic, the periosteum and the bone should be divided in the same plane, and care taken to remove any periosteal shreds present. Clinical results seem to indicate, however, that the aperiosteal method (Bunge) is more likely to give an end-bearing stump, even in the presence of infection.

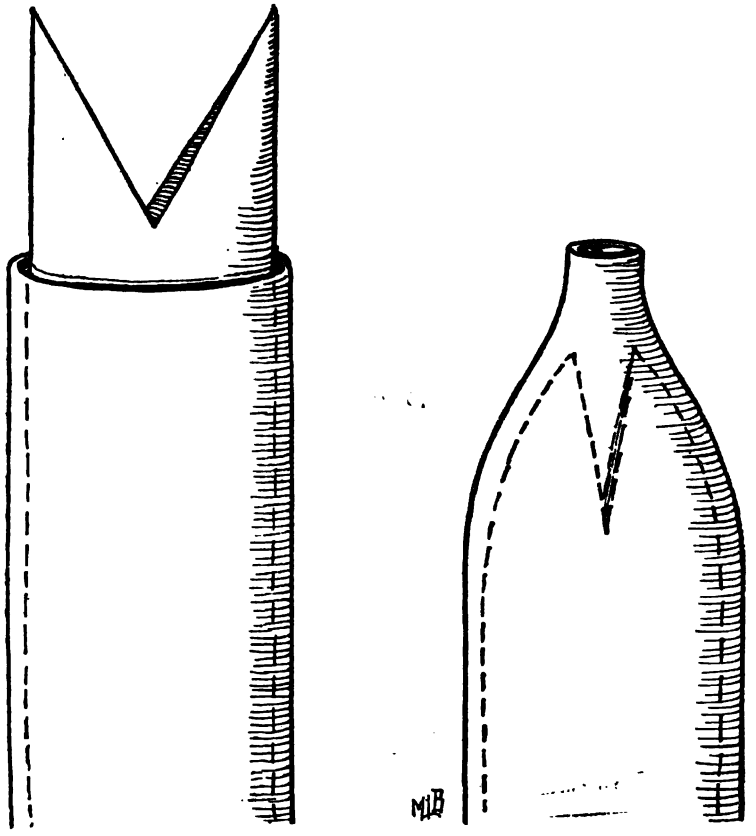

FIG. 1.—The fish-tail method of treating the nerve end, showing the manner in which it is divided and how the points fall together and are covered by the sheath after retraction.

In this method 1 cm. of the periosteum is removed from the end of the bone and the marrow curretted out for the same distance. Care must be taken not to remove too much of either the periosteum or the marrow in order to avoid the danger of a localized osteomyelitis in the end of the shaft. The osteoplastic method seems to offer an ideal technic but it is obviously unsuited to any other than ideal conditions.

RELATION TO THE SITE OF AMPUTATION

While as a general rule amputation should be performed at the lowest possible level, yet this is not always the case. In some instances

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a higher point is made desirable by anatomical conditions or by the requirements of the artificial limb. As an example of the former may be cited amputation through the tarsus in which sooner or later a position of equinus is likely to result and walking becomes difficult or impossible. The best example of the latter is disarticulation (except at the shoulder, hip and wrist). Although the retention of the bony enlargement of the proximal portion of the joints is of decided advantage in retaining the artificial limb in position, yet the best type of appliance requires several inches for the joint mechanism, so that if this were used in the case of disarticulation, it would result in making that segment of the limb longer. It is true that the ordinary type of joint may be used, but as this is placed on the sides of the stump, it gives a very bulky appearance and the construction is weaker. It is usually regarded as preferable, therefore, to amputate at a sufficient distance above the joint to allow the necessary room for the artificial limb mechanism.

In this connection, however, attention is again called to the fact that in the flapless, or so-called guillotine, operation no consideration is given to these points just mentioned, the bone always being divided at the lowest possible point and reamputation performed later under more favorable conditions.

Upper Extremity.—In the *hand* it is generally recognized that "the importance of preserving as much as possible of the thumb and fingers need hardly be emphasized. A thumb, or part of a thumb, together with some portion of fingers or hand to which it can be opposed, is more useful than any artificial contrivance which can be fitted. In this region irregular operations—trimming, removal of splinters of bone or sequestra, etc., are likely to give better functional results than any set amputation."[5]

At the *wrist* there is a decided advantage in disarticulation on account of the better preservation of the forces of pro- and supination, which are now being used to activate the artificial hand. Moreover, in this case it is easy to put the necessary mechanism below the wrist. A further advantage in amputation at this point is that the enlargement of the wrist is a decided aid in holding the artificial arm in position.

In the *forearm*, amputation in the lower part of the middle third gives a good and useful stump. While the circulation of stumps in the lower third is often poor, yet the better preservation of the power of pro- and supination that is secured by amputating as near the wrist as possible makes this site desirable; to ensure freedom of these movements every precaution should be taken at the time of operation to guard against

[5] Official Memorandum on Amputation. London, March, 1916.

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union of the ends of the bones by osseus or fibrous adhesions. Above the middle of the forearm it becomes of increasing importance, the nearer the elbow is approached, to save every fraction of an inch possible. When the stump is less than three inches, great difficulty is experienced in preventing it from slipping out of the socket, owing particularly to the action of the biceps tendon during flexion of the elbow, and with the short stump there is also naturally a decided loss in leverage. "If it is impossible to get a forearm stump extending at least an inch and a half below the insertion of the tendon of the biceps, amputation above the condyles of the humerus is to be preferred."[6]

In the *upper arm* the lowest point at which amputation is desirable is just above the condyles (about 2 inches above the center of the joint); the reasons for this are similar to those already discussed. From this point the longer the stump the better. Above the middle of the upper arm the surgeon must utilize every surgical expedient to save all the length possible; the power to control an artificial arm diminishes to an alarming degree with each loss of even a slight portion of bone. But little can be expected from a stump in which the bone extends less than 2 inches below the axillary fold. Since a terminal and even an adherent scar is not particularly objectionable in the upper extremity, owing to the pressure being exerted laterally, skin-grafting (usually inadvisable in a leg stump) may be employed to cover defects rather than a re-amputation performed. Moreover, in some cases, "a good deal can be gained by removing wholly or in part the folds of the axilla, that is, the pectoralis major and the teres minor. This has been done with good results and seems to be an operation worth doing in suitable cases."[7] It is always advisable to retain any portion of the upper end of the humerus, even if only the head, rather than to remove it (as is necessary under similar conditions in the thigh), since the appliance is fitted much more easily when the glenoid cavity is filled.

Lower Extremity.—In the *foot* it is undesirable to save a solitary toe, even the great toe. Amputation just back of the heads of the metatarsal bones, in front of the attachment of the tibiales and peronei, may be fitted so as to give a useful foot; but amputation through the tarsus, back of the muscular attachment just mentioned, is usually unsatisfactory, as sooner or later a condition of equinus is likely to result due to contraction of the unopposed calf muscles and walking becomes difficult or impossible.

At the *ankle* a satisfactory end-bearing stump is usually secured by Syme's amputation, in which the bones are divided just above the joint

[6] Little, E. M.: *Brit. Med. Jour.*, Oct. 28, 1917, p. 550.
[7] *Ibid.*

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line and at right angles to the long axis of the tibia. The Syme is preferable to the Pirogoff, as it gives more room for an ankle joint mechanism and avoids the difficulty frequently encountered in keeping the end of the os calcis in position.

In the *lower leg* the middle third is generally considered the most favorable site; many artificial limb makers[8] prefer amputation at the middle of the leg to any amputation back of the toes. With proper surgical precautions and a good modern artificial limb, end-bearing usually should be secured and the gait be practically normal. The fibula should always be cut an inch shorter than the tibia and the sharp point of the tibial crest removed in the usual manner. The lower third is not so favorable; the tibia is smaller at this point and so not so satisfactory for end-bearing, and circulatory disturbances are not infrequent. In the upper third a very short stump of course gives poor leverage but fair results are sometimes obtained with as little as 2 inches of bone. However, a stump as short as this is usually inadvisable, as it will ordinarily have to be fitted with the older type of knee-bearing leg—with the tibial stump bent to a right angle; this has only the advantage of direct weight-bearing, which can usually be secured by amputation at the lower end of the femur, and possesses all the disadvantages incident to artificial knee-joint construction.

Emphasis needs to be laid on the fact that the old "site of election" (4 inches below the knee) was intended to produce this direct weight-bearing stump and must now, therefore, be entirely disregarded.

In the *thigh* the best amputation is, of course, one just above the condyles; when conditions permit, the patella may with advantage be utilized to cover the end of the femur. (The preservation of a part of the condyles, with the patella imbedded in them, is favored by some limb makers, as it enables the weight of the apparatus to be borne by the leg itself). Above this point all the length possible should be saved, as the possibility of end-bearing decreases rapidly as the upper limit of usefulness as regards leverage is approached. (See table, from Little.) A stump in which the bone is less than 3 inches, measured from the pubis, is of little value, and exarticulation is preferable. The linea aspera requires attention in the same manner as the crest of the tibia.

To avoid shock a sub- or intra-trochanteric amputation may be first performed by the flapless or short flap method, and the removal of the end of the bone left for a later period.

It is now possible to fit an exarticulation of the hip with a very satisfactory appliance; in some cases the gait is even better than with the shorter stumps.

[8] Questionnaire. Association of Artificial Limb Manufacturers of the U. S.

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STUMP EXTENSION

When the incision is left open, whether the circular method has been used or the one with short flaps, traction should be applied to the skin, as soon as the acute inflammation has subsided, to overcome retraction and thus limit the size of the resulting scar. If it has been possible to make flaps of sufficient size, the skin may be pulled down sufficiently to approximate the edges and in some cases a secondary suture may be performed; if the tissues are not sufficient to cover the bone, they are kept from retraction until it is safe to perform a secondary removal of the projecting bone or a typical reamputation.

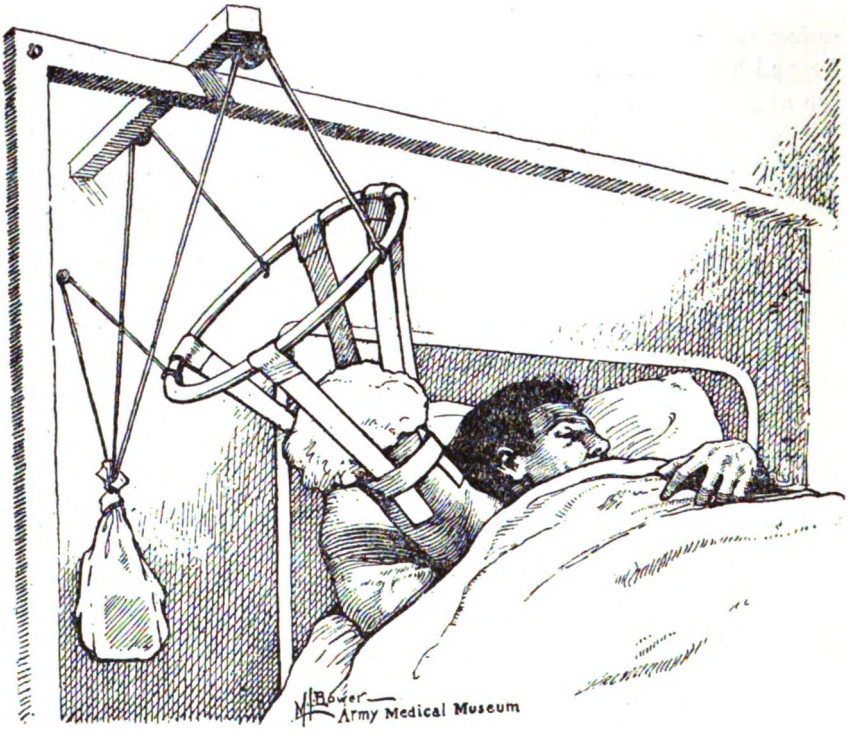

FIG. 2.—"The extension apparatus applied to a stump after amputation through the upper third of the arm." (From Bryan.)

The two methods of extension illustrated (Figs. 2 and 3) seem to meet all indications. In both, adhesive strips are applied to the stump in the axis of the limb as far as the joint above and held in place by a circular strip, or pieces of gauze are applied in a similar manner with the adhesive glue; the ends are fastened to a ring, which may be attached to a weight extension or to the end of a modified Thomas knee splint.[9] The stump

[9] Sinclair, M.: Collection of Fracture Apparatus Used in the British Army. International Conference, May, 1917.

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is thus left accessible for dressing. According to Bryan[10] "the method of extension by weight and pulley gives more powerful and continuous traction than a fixed extension; it allows more movement in the joint above; it adjusts itself to the patient's movements in bed and he is more comfortable and more easily nursed."

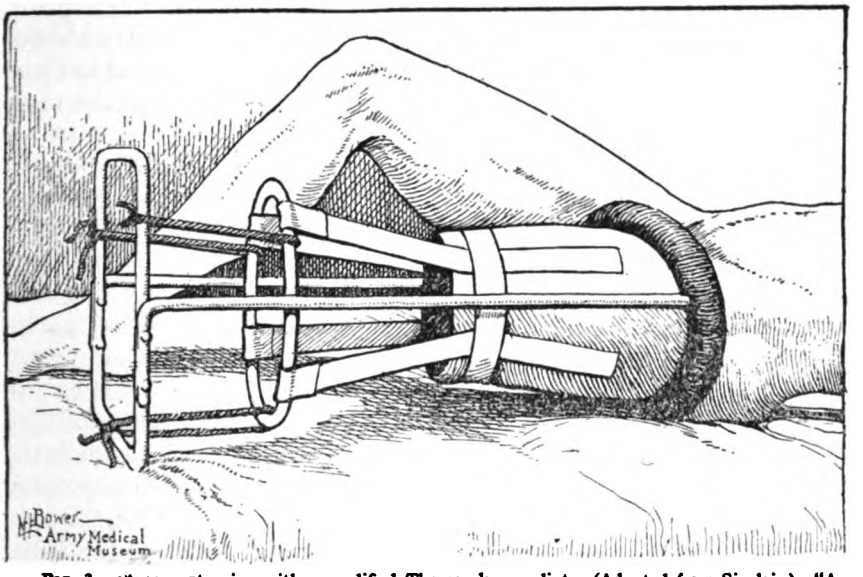

FIG. 3.—Stump extension with a modified Thomas knee splint. (Adapted from Sinclair.) "A Thomas knee splint is cut down and a 9-inch square rivetted on to the side bars 12 inches beyond the end of stump. An 8 inch circle of aluminum is attached by gauze and glue to the skin of the stump so as to be 6 inches distal to the cut surface. Extension is made from the ring to the square either by tapes or rubber bands. The square acts as a pedestal and also for the attachment of the extensions."

THE CARE OF THE STUMP

Proper care of the stump is indicated broadly for two reasons: (1) to secure ultimately the maximum degree of usefulness, and (2) to minimize the difficulties associated with the first attempts at using an artificial limb and thus avoid discouragement of the maimed.

Freedom from sensitiveness to pressure is the chief qualification of a good stump and is the measure of its capability for end-bearing. This is mainly dependent on the absence of swelling and congestion in the soft parts and above all of exostoses on the bearing surface of the bone. (See also "Painful Stumps.") It is evident, therefore, that those measures must be used which will hasten absorption and prevent the formation of exostoses or limit their location to less harmful areas. In addition to the measures usually employed for such purposes, namely, elevation of the part, bandaging, massage, hydrotherapy, electric light

[10] Bryan, C. W. G.: *Journ. R. A. M. C.*, May, 1916.

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baths and electricity, particular emphasis must be laid on the benefit derived from early functional use; carefully graduated pressure on the end of the bone helps to give it a smooth and rounded shape and limit the formation of exostoses to the less harmful location at the sides. Hence early functional use is the second prerequisite for end-bearing; the most careful surgical technic may be of no avail if the proper care of the stump is not begun at the earliest possible moment. This undoubtedly is the explanation for the fact that artificial limb makers are as a rule not enthusiastic about the possibilities of end-bearing; the cases reach them too late for anything further to be gained in this direction, so that unless the surgeon has prepared the stump for end-bearing by the early institution and the persistent use of the necessary measures, end-bearing will be possible only in exceptional cases.

Muscular weakness and limitation of motion are two of the chief causes of discouragement in learning the use of an artificial limb. Considerable strength is obviously required to manipulate it satisfactorily. The demand is naturally greater with the shorter stumps and is still further increased if joint stiffness is present. When a contracture has been allowed to develop, this may make the use of an artificial limb difficult or impossible, as, for example, in amputation of the thigh the stump tends to become slightly flexed and abducted, and this may easily become sufficient to prevent the use of an artificial leg until it has been overcome. The preservation of the full range of motion of the joints above the site of amputation is therefore of particular importance. The incentive to movement of the part is absent and hence limitation of motion develops more rapidly and is usually difficult to overcome, particularly in the case of a short stump, owing to the poor leverage afforded. Contractures must, therefore, be guarded against from the first and movements of the joints must be begun just as soon as the condition of the incision permits and persisted in until the full range of mobility in all directions is assured.

ROUTINE FOR PROPER STUMP TREATMENT

To meet all indications the plan of treatment must be systematic. *While the incision is healing,* at each dressing the stump should be moved to the full limit in the opposite direction to that in which a contracture is likely to develop. In forearm stumps, movement should be carried out in supination and extension; in upper arm amputations, in upward and backward motion; in the lower leg, in extension and in thigh amputations, in extension (securing hyperextension) and adduction. It is usually advisable to keep all stumps elevated while the patient is recumbent and therefore particular attention should be directed to thigh amputations because this position favors a flexion contracture; to coun-

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teract this tendency it is recommended that once or twice each day the pillow be removed from under the stump and placed under the buttock, thus allowing the stump to drop into hyperextension. Further, advantage should be taken of the position in which the stump is dressed in order to guard against the tendency to contracture; thus in forearm stumps, where supination is hardest to control, the dressing should be applied so as to maintain the bones in this position. When the incision has had to be left open, movement of the joint in the other directions, also, should be added as soon as conditions permit.

As soon as the wound is healed, or practically so, and while the patient is still confined to bed, the following routine (modified from Hirsch) is begun:

1. *Massage.*—The stump should be massaged for a period varying from ten to thirty minutes, once or twice a day, according to its size and position. The region of the incision should naturally be avoided for the first few times and care taken not to make undue tension on the fresh scar. As rapidly as the tolerance of the stump will permit, the depth and the force of the massage should be increased up to the full normal limits.

2. *Bandaging.*—After the massage, the stump should be redressed with a cotton dressing, bandaged snugly in place, or if it is well healed, a bias flannel bandage alone may be used. The latter, when properly applied in several layers, gives a firm, even pressure.

3. *Pressure Exercise.*—The patient is directed to press the end of the bandaged stump against a cushion, placed in the bed or against a frame. This must be begun with care, pressure being made at first for only several minutes at four or five hour intervals; if there is no unfavorable reaction, it should be increased gradually up to five or ten minutes every two hours and then every hour.

4. *Movements.*—After each pressure exercise, active movements of the stump are to be made in all directions, to the full limits of the joint motion, for three to five minutes. Later, some form of resistance movements may be added to advantage, in order to still further build up the strength of the muscles controlling the stump and so make the early use of the artificial limb more easy.

5. *Baths, etc.*—Hydrotherapy in the form of hot packs or warm baths, or electric light baths are to be used as indicated to improve the circulation and hasten absorption. The contrast bath is particularly valuable, the rapid dilatation and contraction of the blood-vessels which it produces causing a marked improvement in the local vascular and nervous tone; the simplest method of application consists in the use of two buckets, the stump being plunged first into the hot water and then

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into cold, as rapidly as the patient can change it, for five or ten minutes.

When the patient is able to leave the bed, the measures just outlined are to be continued, but in the case of leg amputations the pressure exercise is to be discontinued as described and direct weight-bearing on the stump begun. A stool of the proper height and a cushion are provided and the patient, supporting himself with his hands, allows at first only a little weight to rest upon the bandaged stump; the amount of weight borne and the time are then gradually increased, in a manner similar to that used in the pressure exercise in bed, until the entire weight can be taken on the stump. The patient may then carefully begin to hammer on the stool with the end of the stump, in imitation of the pounding which takes place in walking with an artificial limb provided for end-bearing. As soon as the patient can stand alone for a long time without getting tired, and with no other support than that needed to balance himself, a temporary leg, properly provided for end-bearing, may be fitted and walking begun, crutches being used guardedly and dispensed with as soon as possible. For a long time, however, the patient should continue to practice standing on the bare stump on a hard surface three times a day.

The value of end-bearing is generally admitted. The measures suggested, both with respect to the amputation and the care of the stump, are simple and have borne the test of clinical experience. Their persistent use is urged upon all. While it is recognized that in very many cases the presence of long continued infection will seriously delay the institution of proper after-treatment, yet much good may still be expected even when begun late, and there will be a large number in which the routine may be followed from the first. The ideal cases will obviously be those requiring reamputation, which will naturally be deferred until entirely favorable conditions can be secured and which can, therefore, be performed solely with regard to the requirements of the artificial limb. Even when the attempt to secure end-bearing is unsuccessful rigid adherence to the routine just described is still to be insisted on; the improved conditions of the stump, the greater freedom from pain and the avoidance of much of the discomfort usually associated with the early use of an artificial limb are more than sufficient to repay one for the additional trouble.

SYSTEMATIC EXAMINATION OF RANGE OF MOTION

The joint motion should be tested by the surgeon at regular intervals, particularly in bed-ridden infected cases, in order to be certain that the full range is retained. At the elbow, in addition to verifying the presence of complete flexion and extension, the freedom of rotation of the

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radial head must be determined and particularly with reference to outward rotation (supination); the value of the movements of pro- and supination in activating the artificial hand will depend upon the degree possible, the loss of even a few degrees making a great difference. Of the movements of the shoulder girdle (upward, downward, forward, backward, and circumduction), the upward and backward ones are the most important; these may be easily tested with the patient lying at the edge of the bed or turned on the opposite side. At the knee it is well to remember that there are normally a few degrees of recurvation. In testing the hip, the presence or absence of flexion deformity may be determined (following the method used in hip disease) by flexing the opposite thigh fully on the trunk, the stump rising from the bed when a contracture exists, or with the patient lying on the face, the degree of hyperextension may be determined (again as in the similar test used in hip disease) by lifting the stump with one hand while holding down the buttock with the other; in testing the amount of adduction, movement of the pelvis should be controlled with one hand while the other manipulates the stump.

AFFECTIONS OF THE STUMP

Sinuses.—Persistent sinuses are an occasional source of annoyance. They are a hindrance to the proper use of the measures necessary for the care of the stump and delay the fitting of the artificial limb. Necrosis of bone is naturally by far the most common cause; as is well known, sinuses due to this cause may close temporarily and even remain closed for several weeks. In addition to other diagnostic methods, radiographic examination is most helpful; should a sequestrum be disclosed, its removal is, of course, called for. In old sinuses the possibility of specific disease will naturally always be considered. Occasionally sinuses are due to foreign bodies, as for example, to retained silk, a suture and ligature material which should not be used in this work.

Ulceration.—Ulceration of the skin of the stump is sometimes troublesome. The common cause, in the stump itself, is poor circulation (most often seen at the lower third of both arm and leg) and this is favored by general debility, constitutional disease and intemperance; when there is too great tension on the scar, due to too short flaps, it is likely to break down and an ulcer form. Ulceration is more common, however, after the use of the artificial limb has been begun and is then usually caused by a poorly fitting socket which allows friction or causes unequal pressure; in some cases also it results from the circulation to the end of the stump being cut off by a socket which is too tight around the top.

Painful Stump.—Painful or sensitive stumps constitute one of the chief sources of difficulty in the satisfactory adjustment and use of the

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artificial limb. The cause may be in the soft tissues, the nerves or the bone. In the soft tissues, atrophy may be so extreme as to leave the bone insufficiently protected or the pain may be caused by an adherent scar with defective nutrition. Both these causes are avoided by the use of the proper after-treatment. In the nerves, pressure from scar formation or over-growth of the nerve end are not now so common as formerly, since greater care is usually given to this part of the technic of amputation. Cases which do not yield to ordinary measures will require operation, the compressed nerve being dissected free or the bulbous end treated by the method already recommended. By far the most common causes of pain are found in the bone itself; these are exostoses, osteitis or periostitis and small areas of osteomyelitis. To determine the exact source of the trouble is often difficult and may tax all the ingenuity and patience of the examiner; an X-ray examination of the bone should always be made in such cases and the possibility of specific disease carefully considered.

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MEDICO-MILITARY NOTES

By Major R. W. HINDS

Medical Corps, N. G. U. S. (formerly with the American Red Cross)

(Concluded)

In Belgium the most striking thing in wounds was the appearance of the muscular tissue in the path of the bullet. This path was fully two-thirds of an inch in diameter. The tissues were pulpified as if ground in a mortar—total loss of structure, a grayish red, but enough connective tissue bands left so that it was quite tenacious; an oozing mass.

If clean, spontaneous recovery occurs, so that wounds of entrance and exit are barely visible. Many cases of this kind are seen in hospitals at the rear, with a consequent misunderstanding of the damage done by the high-power bullet. The pulpification of tissue accounts, to my mind, for the ease of infection, secondary hemmorhage or aneurism, and severe neuritis cases. Foreign substances carried into the wound by rifle bullets, I will discuss later. Shrapnel balls, on account of their size, are apt to carry in pieces of clothing, and shell fragments still more so. Large pieces of shell carry ahead and cut out pieces of clothing which exactly fit the face of the fragment that presented on entrance to the body. The amount of foreign substance found in the path of the projectile, or perhaps just in front of it, if lodged, is astonishing.

The indications for operation on wounds of soft parts are simple; cut away the skin edges and fascia at the wounds of entrance and exit and look at the muscular tissue. Macroscopic dirt means that the wound should be opened wide, and the tissue, with the dirt it bears removed. This is the only way to get the dirt out.

The methods of La Panne were undoubtedly influenced by the fact that gas gangrene was most prevalent in that area. But one look at the amount of foreign substance found in wounds would convince anyone that the most radical sacrifice of tissue is necessary. If pulpified tissue is left, it rots out with secondary hemorrhage. The futility of first-aid packages in these cases is most evident.

At base hospitals the location of foreign bodies, metal and bone, is difficult. The X-ray, two views at right angles to each other, helps a lot. A really satisfactory method of localization I have yet to see. The fluoroscope is still better if used during the operation. In hospitals near the front an X-ray is necessary to show if a retained foreign body exists, not by any means easy to determine, and in a general way its location. In fresh wounds the path of the projectile is easy to find.

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Frequently a rifle bullet wound, for some reason with little or no pulpified tissue and clean, will be hard to follow, and these are the cases that are better left with a simple opening of the wounds of entrance and exit, or, if no exit and no evidence exists of dirt having been carried in, left alone. Undeformed bullets in wounds are the exception, core and lead fragments being the rule. As an example of the unexpected and also of the necessity for an X-ray I will cite the following case. A wound of entrance and exit were not directly connected. The projectile had glanced off the femur, leaving an angular path, but a fragment had taken another angle. It went to the other side of the femur and lodged. It would have been entirely missed without an X-ray. So one entrance and two exit wounds are a possible combination. Two wounds on opposite sides of an extremity are not necessarily entrance and exit; they may both be entrance wounds. Men with multiple shell wounds may have wounds on opposite sides of the body, due perhaps to ricochet.

Shell wounds of the lower back, buttock, and thigh are of most frequent occurrence for the reason that when there is an explosion a man naturally crouches forward, and the exposed part is hit. Layers of clothing carried into a wound have, when found, the appearance and feel of felt wadding. I found in one case the shoulder seam, with turned-in edges of an overcoat, part of its lining, a piece of the under coat and its lining. Grenade wounds are usually multiple, forty odd in one case. If the explosion is close by, there may be almost complete destruction of a member, or loss of life.

I saw a number of cases where a bullet had passed between the tibia and fibula and the developments of these cases were so similar that they are worth describing. Upon paring the skin edges and trimming away the fascia, the muscle was seen to be dirty and pulpified to a marked extent, so this also was removed, the whole channel being in the same condition. A centrally located blood clot was removed. An obstinate oozing made necessary the ligation *en masse* of tissue which included the anterior tibial, or the ligation of the artery itself, followed by a similar ligation of the posterior tibial. In these cases the operator often feels that he has injured the vessel with his scissors, but after he has found the same condition repeatedly, he begins to believe that the impact of the bullet, the vacuum in its path, or whatever the cause of the pulpification, must have injured the vessels, which later stopped bleeding through a combination of clotting and pressure of the surrounding clot. The foot of the patient is then pulseless and looks bloodless. In a large majority of cases the day following shows a foot of good color and warm. Some come to amputation shortly, usually as a result of gas gangrene rather than failure of the circulation of the extremity.

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At Haslar I saw a few cases of blindness, a result of explosions, fundi negative, sometimes with subconjunctival hemorrhage. The cause at that time was variously attributed to hemorrhage from the artery, injury to the nerve near the entrance to the orbit, or to concussion. These were all cases from warships.

At Haslar they paint the plaster casts with a 3 per cent methyl alcohol solution of iodine, as the result of which they do not become foul, due to the antiseptic action of the iodine. Dr. Wildey, staff surgeon, also uses iodine, same strength, in atomizers with a double bulb to insure a steady flow and rubber instead of metal connections. Although irritant to the eyes the highest efficiency is claimed for it, as well as an even distribution to the skin, with less risk of burns, and a saving of five-sixths of the expense, as five-sixths of the iodine is usually thrown away with the swab. Clean operative wounds are sprayed every day, and it is claimed that stitch abscesses have never developed.

The preparation of the skin before operation is worthy of mention. Following the usual shaving and cleansing of the skin at time of operation, the skin is wetted with alcohol and scraped repeatedly with a straight edge, to remove loose corneal fragments, also to express secretion from the mouths of the glands. The amount of material gathered on the edge of the scraper is astonishing. Then the iodine spray is applied.

Padded splints are covered with a waterproof material like oiled silk and, if soiled by discharges, are kept odorless by an iodine spray. Should the splint be posterior and it is not desired to move the limb, a strip of gauze wet with iodine is passed between the splint and the extremity and pulled back and forth until the splint is coated.

Bullet wounds of the abdomen at La Panne were all operated upon and, in a great majority of the cases, the localized injury to the small gut was so great that it was impossible to suture it and leave a patulous gut, so a resection and anastomosis, or sometimes several, were the rule. The mortality was very high, due in all probability to late operation, on account of a long journey in an ambulance. A part of the routine was to use ether in cleansing the peritoneal surfaces.

Empyema was common, most of it following infected haemothorax cases, the rest coming from extensive wounds of the chest wall. The treatment was resection of a piece of rib about 4½ inches long, the skin and the pleura being sutured together. Pus pockets form in the region of the collapsed lung and have to be evacuated. A case in England illustrates the resistance of some of the soldiers. This man was shot through the chest low enough to hit the liver, and the report of his condition was that bile was being discharged through the wound.

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However that may have been, when I first saw him he was suffering from an empyema with insufficient drainage, the result of an infected haemothorax. I enlarged the resection wound and got better drainage, but he was in bad shape. Finally he discharged a putrid mass of tissue through the wound and for a while thereafter parts of his food would be discharged through his back, following the meal. The discharge was not acid or gastric in odor. It later stopped spontaneously. Dr. Osler and our X-ray man examined him by means of bismuth and the fluoroscope, and reported that they could see no abnormality.

I saw three cases with destruction of the upper quarter of the humerus. All recovered with useful arms and one had considerable deltoid action.

When and how often should cases be operated upon?

1. Obviously as soon as possible, so the hospital must be near the front.

2. But once in a half-equipped hospital, the patient will get half an operation, that is, he will get drainage—perhaps partial control of hemorrhage, and probably removal of foreign bodies, for field hospitals are usually working under pressure and circumstances and surroundings are not conducive to thorough work. As a generalization, (1) may be sacrificed to (2), that is, better have the hospital further to the rear, with a longer ambulance ride for the patient, than have him half operated upon in a field hospital, leaving the work to be completed farther back. Critical cases will not survive two operations.

As to abdominal wounds, I doubt the wisdom of the old teaching which advocated leaving them alone, rather than subjecting them to the jolting of an ambulance. Under this plan the only type that would survive would be a few of those with wounds of the large gut. What little hope there is for shell wound cases lies with a fully equipped hospital. Field hospitals would do better to devote their valuable time to many slight cases rather than a few severe ones. In other words it would be better to tax motor transport, rather than cripple the field hospital staff, with bad cases that would render the organization even less mobile.

Fully equipped hospitals as near the front as possible are best. By fully equipped I mean an operating room in a house, portable if you prefer, but with an autoclave, X-ray, a receiving room in which the patient is stripped and bathed, rather than carried, dirty, direct to the operating room.

The wards may be under canvas, but I cannot imagine decent surgical appliances and methods under such conditions, though I admit I would rather have a tent fall on me as a result of shell fire than a house. Again,

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an all-wood hospital would be sure to be burned. If canvas is used it must be rendered light tight or fall an easy victim to air raids.

In the area near La Panne, the evacuation of wounded in the majority of instances was impossible except at night. Consequently our cases arrived in from one to twenty-four hours after they were hit. A small percentage, being wounded in an isolated position, did not get in for two or three days. Nearly all had received merely first-aid treatment.

GAS GANGRENE

Gas gangrene is responsible for a large majority of the deaths in this region (La Panne). Early operations saved many, but cases from isolated positions, without surgery for two or three days, were apt to succumb. If a case with gas gangrene survived the third day he was apt to live. The deaths in these cases occur early. Contrary to my preconceived ideas of gangrene. During three months I did not see bleb formation. Extensive discoloration of the skin was comparatively rare and almost always followed by death. Crepitus was considered a late manifestation rather than a very early one. I saw no bloody froth exuded from a wound as I expected. Gas gangrene is a rapidly developing and, without radical treatment, fatal disease, so the earliest signs are the ones which should be emphasized. They are as follows. There is a foul odor when the dressing is removed. It has a peculiar musty quality, sweetish, and is very penetrating. Ill-defined red-brown discoloration of the skin appears in the vicinity of the wound, not unlike the familiar slight ecchymosis, from which it has to be differentiated. These marks are distinguished by a reddish tint sometimes described as bronzing. They spread, and in a few hours become confluent. Either of the above may be the first sign noted. If the red-brown spots are incised, the subcutaneous connective tissue is found pale, with greenish-yellow fat globules projecting through and bathed in dark tinged blood which does not look venous nor yet arterial—but more like postmortem blood. A smear or culture from this blood will quickly confirm the diagnosis which has already been made, if conditions are revealed as described above. A valuable point for prognosis is found in the bacteriological report—whether conditions favorable or unfavorable for the growth of the organism were reported. In the latter case the mixed infection was pretty sure to starve out the gas organism.

If the infection is deeper and advanced, shaving the part will elicit an interesting sign. The razor causes a different sound in passing over the area; the ring becomes suddenly flat as though shaving a drum head. The part may be swollen and is usually tense, more from deep hemor-

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rhage than from gas in the tissue. But it is a bad sign, as gas gangrene seems to find a particularly favorable media in blood clot. Incision along the tract of the projectile will reveal protruding blood clot, necrotic connective tissue which is easily picked out and lusterless grayish muscle which does not bleed well. In late cases there will be an audible escape of gas from the depths of the wound. The whole picture suggests an autposy rather than an operation. I am told by a reliable witness that, in the earlier days of the war, at a hospital in southern France where cases were received that had been a long time in transit, upon cutting the bandage the dressing would be actually blown off by the accumulated gas in the wound.

Even a fairly advanced case will show little systemic change—slight elevation of temperature, facies normal, white blood count slightly elevated, most characteristic sign of all a rise in pulse out of proportion to the slight rise in temperature and sometimes pain in the part. In the last few hours of a fatal case the change is rapid. The skin changes in color and becomes bloodless like a cadaver. The patient is moribund with a weak pulse becoming inpalpable.

The staff often mystified me at first by prophesying that a given case would develop gas gangrene before the above early symptoms appeared. They would make this statement for cases that came from Nieuport, and were almost always correct. Again, it seems that shell is most apt, shrapnel next, and bullet wounds least apt to develop gas gangrene, varying directly with the quantity of extraneous material which they may carry into the wound. Viewed from another angle, wounds of the hand never developed gas gangrene; wounds of the face, but one in the history of the hospital. Wounds of the buttock and thigh almost always developed it, the order of occurrence in the body being about as follows: buttock, thigh, leg, trunk, shoulder, arm, forearm and neck.

Wounds of the scortum were fairly common, but none of the surgeons I asked had ever seen gas gangrene develop in that part. It seems that clothing carried into the wound is directly responsible for the infection. The covering of the lower part of the body, being more in contact with the dirt of the trench, is more certain to carry a culture. In sitting, the gluteal region is most impregnated with the dirt.

We had many civilian wounded from the towns, often very dirty physically, having been wounded in their cellars where they fly at the first shell. Gas gangrene was rare among them though, as in soldiers, dirty wounds of the gluteal region were common. Officers developed gas gangrene, but not so often as the enlisted men.

Early and very radical surgery is necessary to cleanse the wound.

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Cut out the tissue which bears the macroscopic dirt, and all tissues whose vitality has been impaired. If very dirty, a plug of tissue, say 1½ inches in diameter, is removed *in toto*. Through and through drainage is essential, followed by peroxide irrigation and wet dressing.

Frequent examination of the wound during the first three days is the most important part of the treatment. If gas gangrene develops, cut out all changed tissue and inject oxygen gas into the adjoining tissues, particularly along the fascia planes. The preference of the gas bacillus for connective tissue is most noticeable in these wounds. Spreading from the wound proper, necrotic fascia can be followed along its planes, with contiguous muscle affected only in a thin layer. As far as possible, no overhanging skin edges should be left. The dictum, "make a closed wound into an open one," is excellent. If the gas gangrene spreads in spite of radical surgery, repeat the operation, removing all the newly affected tissues. It is necessary to do this daily or even twice a day for several days. In the case of an extremity amputation may be necessary. In successful cases gas gangrene ceases spreading, giving way to a mixed infection. At La Panne practically all the primary flat amputations developed gangrene between the layers of the flaps, where, of course, ideal conditions for an anaerobe exist. So all amputations were cut straight across the bone at the level to which the muscle retracted, in this way leaving the least possible area for infection, and that fully exposed. Later, when clean and granulating, a flap operation was performed. Gas gangrene in the presence of a compound fracture, or where the circulation of the part is markedly impaired, is a sufficient indication for an amputation.

Aerobic infections are not feared, but are almost welcomed, because the anaerobic gas bacillus does not thrive with them.

A perforating wound should be so cut that it may be described as two cones with apices joining. This sounds pretty radical, but the loss of tissue, or even life, as a result of the spread of gas gangrene, is much worse.

In the field where oxygen gas could not be obtained, atmospheric air, forced through a hollow needle by a Davidson syringe, could do no harm. As to air embolism and the risk of peroxide in sinuses causing the spread of the infection, I saw nothing to suggest either.

A type of surgical glove, used in England and Belgium, was laughed at in the beginning but admired afterwards. It is as thick or thicker than the yellow household variety, but is made of excellent material and has a gauntlet. The fingers are large in circumference, but not long. It is always tight at the finger tips, so knots can be tied with ease. We carried with us regular surgieal gloves that are better but do

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not last long. Gloves and instruments can be readily sterilized in a mixture of one part glycerine to three parts water, requiring a higher boiling point but affecting rubber and nickel less.

All types of scissors soon become useless unless they are large and very heavily constructed. We never had too many haemostats. Many knives are needed. Very long hinged dressing forceps make for better asepsis, when assistants are not scrubbed up, and are very useful in the wards. The variety with the tip not too large is indispensable for placing drains in long sinuses. At La Panne Dr. DePage has an instrument maker who turns out perfectly made instruments, such as haemostats or scissors.

A lot of rubber tubing is necessary, for use in irrigators, as drains and as tourniquets. In a through and through drain I am fond of cutting one hole about the middle, connecting the irrigator and pinching the other extremity of the drain. By turning it about and moving it a bit up or down it is easy to irrigate all parts from the center outward. In the wards, many irrigating tips, scissors, forceps or small dressing forceps and gloves prevent delay in resterilizing. Silk in two or three sizes in the best all-round suture material for this work. Medium and very heavy are used most.

At the front, leading to each battery or trench, are systems o directing numbers or letters. A sign 4 or 5 inches square nailed to a stake, the whole projecting perhaps 8 or 10 inches above the ground, and wound with barbed wire, so as to make its removal difficult, is used. There was one of these every few feet of the way, guides at night in an otherwise characterless, flat country.

The spiral cloth puttee wears out quickly, is not easily adjusted and it has been criticized by a number of physicians. Many believe the trench frost-bite is attributable to this cause. With marching or long standing the leg increases in size, the puttee becomes too tight and impairs the venous return, which is already taxed. Standing in cold water is another important factor. Belgian troops who did not wear the puttee were little troubled. Of the cases that I saw in England fully 90 per cent showed the following condition. Thousands of men were brought to England with feet so tender that they could not be persuaded to put foot to ground. All that the feet showed was a very slight swelling with slight cyanosis; more often nothing abnormal could be seen. Pain was the most marked sign; it was particularly bad at night. Various methods of relief were tried with little success; perhaps the best was to cover the feet with an ointment. For the pain at night, if advice were given one man to leave his feet out at the foot of the bed, the next night every man in the hospital would have his

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feet out, and continue to do so until he recovered. True frost bite did occur, but it was comparatively rare. The recovery of the slight cases was astonishingly slow. After having seen a few cases I should have put it down to malingering, but after seeing so many I am convinced that the pain is genuine. The mild type is not written up to any extent in the medical journals, but is the type that should interest the military, since it is responsible for the loss of effectives, and this not for weeks, but months.

The summer of 1915 the Belgian troops adapted a very low leather legging which came well down over the foot, without a strap under the instep. It laced up the front like a shoe and the lacings were tied to those of the shoe in front over the instep. It extended but little higher on the leg than the ordinary shoe, just enough to keep the trousers from flapping, and allowed ample ankle motion.

All the troops that I saw wore a heavy shoe with hob nails, a bit like a brogan and too large rather than too small. No cheap shoes were satisfactory. The Italians wore a heavy high shoe like a hunting boot, laced up the front. Most of the continental troops carry an extra pair of shoes under the belt.

The brassard that is supplied always wrinkles up on the under side of the arm. It soon looks like a dirty rag. The device used by the British R. A. M. C. is much better. It consists of a disc about 2¼ to 2¾ inches in diameter with a red cross measuring about 1¼ inches.

In days of motor transports even paved roads require constant care. At intervals, roads are obstructed to insure control of autos that would otherwise go through at too high speed for inspection by sentries. An abuse of headquarters machines was stopped by taking the numbers of cars every time they pass certain points and reporting to commanding officers. Following this, the roads became much clearer and safer toward Dunkirk and Calais.

Chauffeurs of military transport should have dispatch cases with transparent pockets for military passes hanging from the shoulders, as they have to show their papers very frequently.

Between Dunkirk and Adinkerque is a distance of about 7 miles. It was a main supply line with a lot of transports and averaged about two collisions a day, mostly due to drivers unaccustomed to the work, and the narrowness of the road. The old-timers were not particularly careful and drove fast (at least 35 miles an hour), but had few accidents.

The peasant population caused most of the obstruction and accidents. Horse-drawn vehicles come next. Small detachments of troops usually march in thin columns at the sides of the road and do not obstruct the way. I have never seen any large detachment marching,

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and I am sure that motor transport is provided. From La Panne to the front they usually march, as main roads were few and there was a shorter way across the country. Several soldiers told me that during the retreat from Antwerp they marched over 40 miles and slept in the open at the end, and were very glad of that opportunity.

At La Panne the Belgian troops were quartered in private houses. A layer of straw formed their beds. The straw was frequently replaced, the old being burned to the accompaniment of the popping of cartridges. I never saw an accident result from this. Tents are almost never seen. During cloudy or wet weather the odor of the ground in the vicinity of the men's quarters is very strong of urine. The men always smell badly. Except in extreme weather the troops are sent into the surf, bathing by companies. Life guards are provided. Dr. DePage, in his effort to decrease the incidence of gas gangrene, established a hot water plant with twenty tubs, said to accommodate 500 a day at the rate of 20 minutes to the bath. Meanwhile the clothing was sterilized to kill vermin, mended, and new underclothing issued.

The commissary department was not at all in evidence; one would occasionally see portable kitchens in back yards. The men got soups and stews mostly. The kitchens were very simple in construction and on wheels.

The enlisted men have decorations, I should say one to every two or three hundred men. They are so proud of them that I am sure that they have a good effect. Discipline is lax in minor matters, and very severe as to self-inflicted wounds, malingering, and assaults on women. There is very little drunkenness. Some effort is made to provide amusement, but the Belgians do not take to athletic games.

Like the French, they wear overcoats in all but extremely hot weather. Perhaps it is the easiest way to carry them, as they already have all the pack that can be adjusted upon them.

The trenches are dirty and full of vermin. Rats abound. The covered type of trench is particularly odorous. I did not visit enough to be sure of the latrine arrangements, but I am told that they are crude or non-existent.

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A LABORATORY OF EXPERIMENTAL SANITATION AT THE M. O. T. C., FORT RILEY, KANSAS

By Major DANIEL M. SHEWBROOKS

Member Reserve Corps, U. S. Army Instructor in Sanitation, Fort Riley, Kansas

(With two illustrations)

THE creation of a great National Army has necessitated the calling into the service of thousands of civilian doctors who are sent out to take the responsibility of safeguarding the health of our new armies after a few months of intensive training at the various medical training camps.

One of the most important features of this training is to instill an intimate knowledge of the best sanitary procedures, both for camp and field use, which procedures it is believed should be placed upon a definite regulation basis, free from make-shifts and the inexperience of the local quartermaster or sanitary authority.

The civilian physician's ideas on sanitation, as applied to the army, undergo a radical change upon entering the service. He has to forget for the time being that he is solely a reliever of human ailments and, with an open mind and a wholly new point of view, must reorient himself upon his fundamental college and medical education. The new ideas imparted to him must take shape in a minimum space of time and their practical application must be made to conform as far as possible to a uniform standard, founded upon sound and tried principles. But it must be remembered that the doctor, like the man from Missouri, "has to be shown." Text-books and lectures are not enough—he must "see the fire burn and the water boil."

Early in August, the need of a sanitary laboratory at Fort Riley for teaching and experimental purposes, was clearly realized. Men were of necessity sent out from the training camp who had not had the advantages of first-hand knowledge of many of the old appliances and new departures in field and camp sanitation, except that gained from text-books, lectures and tours of inspection, which often illustrated them in a very limited and unsatisfactory manner.

The difficulties in establishing such a laboratory were many: land and unskilled labor were cheap and plentiful, yet there was no one at that time among the Reserve Corps at Fort Riley who had had a wide experience in such an undertaking. There was no appropriation available. Building material was scarce. The literature was widely scattered and difficult to obtain. That which was available was often indefinite in the accurate descriptions and specifications of apparatus.

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Faced thus by the problem of producing a model of the sanitary defenses against disease and filth under such difficulties—a problem which, in actual practice, every medical officer is liable to face—our laboratory *was* established and now occupies a considerable area of ground on the site of a former casual camp, some 200 yards north of the old Post Hospital.

The old casual camp kitchen and storehouse, which had been left standing, was fitted up as a model permanent camp kitchen. Especial emphasis was laid upon the following points: all tables and woodwork so constructed as to allow ready access of the scrubbing brush to all surfaces coming in contact with food stuffs; absolute cleanliness on the part of all cooks and attendants; daily oiling, and sprinkling with fresh sand, of the kitchen floor and the surrounding grounds within a radius of 20 feet; no screens.

Where the above conditions prevail, flies are a negligible factor. In close proximity to the kitchen is the new army field range, No. 2, with all its utensils nested inside. An improvised field ice-box is built into the bank on the north side of the kitchen. From a nearby tree hangs a swinging cage, such as is described in the Manual for Army Cooks.

The several varieties of improvised field ovens—the open trench for baking, a bean pit, an oven in a hill side, a mud oven and a mud range—were built by enlisted men under supervision. The improvised camp kitchen as used by the English, and figured in Lelean, was constructed and has caused considerable interest among members of the Fort Riley School of Cooks and Bakers, where a similar kitchen, it is hoped, will be built and tried out. Other mud ovens, as devised by the School of Cooks and Bakers, are in process of construction.

The field kitchen exhibit has been recently enriched by the addition of the Field Oven No. 1, and a Russian wheeled soup-kitchen.

The disposal of waste water and kitchen sullage water is shown in the two types of apparatus figured in Lelean—"A Strainer, Grease Trap and Soakage Pits" and "A Soakage Pit for Kitchen Sullage." It is further illustrated by a Guthrie type of incinerator, together with a modification of the same.

An interesting combination of incinerator, hot water heater and evaporator for waste water was devised by Lieut. Col. W. W. Reno, M. C. U. S. A., and Private Kenyon, of the Oklahoma National Guard. The heat from the incinerator is utilized in heating a hot water coil which leads to a large cement-lined brick tank. The wash water from men washing their hands and faces, cleaning their mess kits, etc., is emptied into a concrete lined trough surrounding two sides of the base of the tank. The trough catches the inevitable drip following each

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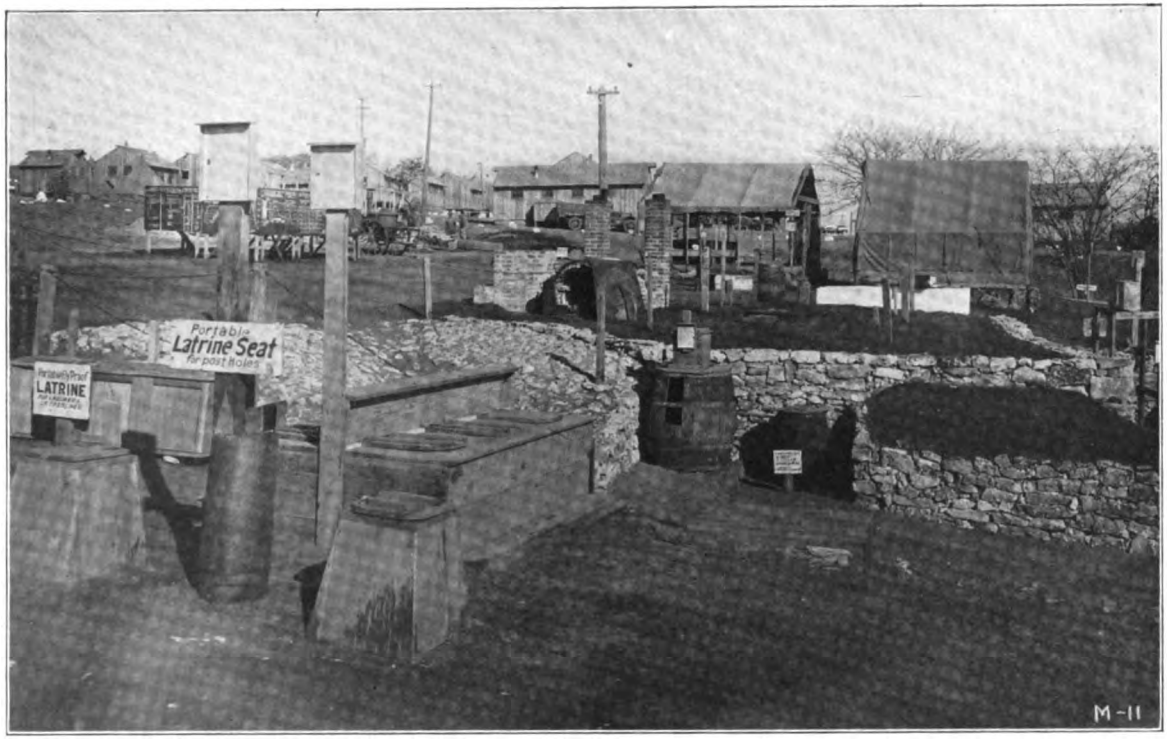

SANITARY CENTER. SCHOOLS OF APPLIED SANITATION, M. O. T. C., FORT RILEY, KANS., 1917.

Shows working models made to scale of various types of sanitary appliances, model tent kitchen in war. Blackboard showing statistics, charts, life cycle of insects, etc., in background.

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ANOTHER VIEW OF SANITARY CENTER, SCHOOL OF APPLIED CAMP SANITATION, MEDICAL OFFICERS TRAINING CAMP, FORT RILEY, KANSAS.
About sixty different sanitary appliances and types of apparatus are demonstrated in this center.

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drawing of hot water. The waste water is drawn into a shallow pit in the front part of the incinerator, where it is rapidly evaporated by the intense heat brought close to the surface of the water by means of a deflecting arch.

Many different patterns of accepted incinerators have been built and several new ones developed. Among the former may be mentioned: the Guthrie, a modified Guthrie rock-pit, Reno-Kenyon as mentioned above, Horse-shoe, Straub, Caldwell, Alamo, Cross trench and circular hearth incinerator, the Richardson incinerator; and combined open rock incinerator and sullage pit.

Especial mention should be made of a large Panama railroad iron incinerator, for manure, requiring the use of over 10 tons of old rails, loaned by the Union Pacific Railroad.

The disposal of human excreta is such an important problem confronting the medical officer, especially in the absence of a general or central system of sewerage, that special emphasis has been laid on the construction of those types of apparatus which will be easy of construction with the materials at hand and yet at the same time be absolutely efficient. Among those shown are straddle trenches, a urine soakage pit, a portable latrine seat, deep trench fly-proof latrine, improvised latrines for first line trenches, improved Lumsden, Roberts and Stiles sanitary privy (public health), and the McMunn for infective solids and liquids.

A company sink with a pole seat was constructed—the type so extensively used in the Civil and Spanish-American wars. This type stands out in sharp contrast to the above types, illustrating admirably the points that a good latrine should not have.

A fly-breeder enables one to study the complete cycle of the common house fly, while the various mechanical methods for its destruction are shown in the different types of fly-traps.

A drying platform for manure before incineration and the large Panama railroad iron incinerator, above mentioned, are among several illustrating the disposal of manure.

Special attention is being paid to anti-vermin measures. Only recently an opportunity was given for the practical demonstration of the Serbian barrel when the clothing of several prisoners was most successfully de-loused. At present a large de-lousing chamber, modelled after the one used so successfully by the Canadian sanitary units, is in the course of construction.

The problem of supplying hot water in sufficient quantities for cooking, bathing and washing purposes is solved in varying degrees, by several types of apparatus—the Saville water heater, used so successfully

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at El Paso; the Reno-Kenyon incinerator, with its hot water attachment. Some of the waste heat of a Guthrie incinerator is utilized in heating a hot water coil placed beneath the pan and leading into a barrel.

One of the features of the "English improved oven" is that one of its furnaces is utilized entirely in heating water.

Several large blackboards have been arranged in a hollow square graphically illustrating: malaria in penal colony (Celli); efficiency of quinine prophylaxis; malaria in Italian army; drawings of the larvae and adult anophales and culex mosquitoes; drawings of the house fly; charts of fly-borne diseases; typhoid and flies at Mhow; typhoid cases traced to direct personal infection, showing stage at which infection was conveyed; agglutines as a result of anti-typhoid inoculation; typhoid in India and in the United States Army; ratio between sickness and mortality in the British wars of the last thirty years; results of sanitary efforts in the Army, 1903-1912; energy balance sheet for eight hours; water needs on the march; diagram showing sanitary arrangement and system of food and water supply of troops in France.

The course of instruction is made as practical as possible. The construction, uses, advantages and disadvantages of the different types of apparatus are carefully explained to small groups of students at the completion of their course of lectures in hygiene and sanitation. They frequently see many new pieces of apparatus in the course of construction, and others in actual operation. These same demonstrations are being rapidly extended to the enlisted medical personnel.

To be certain that the student thoroughly understands the essential points of construction, he is requested to hand in a detailed drawing and description of representative types of apparatus.

The realization of the benefits of this laboratory to the student medical officers has caused Lieutenant Colonel Bispham to extend its privileges to the medical officers at Camp Funston. It is to be hoped that medical officers from others parts of the country, as well as line officers, may have the advantages of a course similar to the one given here.

The very number of incinerators that have been devised in the past few years is proof that no one of them is entirely satisfactory. At the present writing the interest of the laboratory is centered upon the utlization of the waste heat—a factor of especial importance in the present war, where fuel is playing such a large rôle.

A type of incinerator embracing this feature has been devised by Major Williamson and put into successful operation. It is especially adapted to such organizations as are immobile. Another type devised

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by Major Williamson is in course of construction. A new portable latrine has been devised. The question of the utilization of the waste grease and fats from the camp kitchens and grease traps, together with the ash from manure, is being investigated. Many small improvements have been made on old apparatus.

Work is being carried on out of doors as long as the weather permits, but a large hospital ward tent has been comfortably fitted up to carry on numerous new lines of endeavor during the winter and inclement weather.

As a natural outcome of the difficulties experienced in obtaining the literature and specifications of the many pieces of apparatus, it was considered advisable to have a complete set of blue-prints made of each piece of apparatus constructed, together with an accurate description and specifications in order that they might be available not only for the medical officers at this camp but throughout the army. These have been made and, at a request from Washington, a complete set has been sent to the Surgeon General's office.

In the past four months an exhibit has been produced which is a credit both to the training school and to the service. It received much favorable comment from the French and English commissions on their recent visit to Fort Riley. The success of this work is largely due to the resourcefulness and untiring efforts of the director, Maj. Charles Spencer Williamson, M. R. C., who, together with his associates, Maj. Daniel M. Shewbrooks, M. R. C., Capt. William W. Pretts, M. R. C., and Lieut. David Schmalhorst, M. R. C., are endeavoring to make the scope of this laboratory entirely practical.

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EDITORIAL

WHY THE MORBIDITY AND MORTALITY STATISTICS OF OUR CAMPS ARE SATISFACTORY

In 1903 Koch wrote: "It is well known that typhoid is one of the most dangerous of the diseases which appear in war time," and adds, "In the Franco-German War we had 73,000 admissions and 9,000 deaths from it." It will be recalled that the British had something over 50,000 cases during the Boer War with 5,877 deaths, while it is estimated that in 1898 we had 20,000 cases with 1,580 deaths.

As a result of Koch's masterly investigations, in 1904 the Germans began the systematic use of antityphoid vaccination in their army, another instance of the Teutonic capacity to recognize a good thing when it presents itself; for it was an officer of the British Army Medical Service, Sir A. E. Wright, who in 1898 introduced the practice of immunization in British soldiers serving in India.

Our own medical officers were not slow to appreciate the stupendous possibility of eliminating typhoid as a cause of non-efficiency in the United States Army. The vision was there, but it was not until 1909, when Major, now Colonel, Frederick F. Russell, of the Medical Corps of our Army, presented the matter so convincingly that the Medical Department authorities took it up and, backed by the influence of the civil profession, was able to induce the War Department to authorize a voluntary test—but upon the members of the Medical and Hospital Corps only.

Colonel Russell's views and recommendations were formulated in the following "conclusions" published in THE MILITARY SURGEON.[1]

1 Typhoid fever can be stamped out by an aggressive campaign in which the sources of infection are traced by modern methods.

2 This disease is practically contagious and the patients should be isolated and routine disinfection should be carried out, not only until they are convalescent, but also until they have ceased to excrete bacilli.

3 The correct diagnosis at the earliest possible moment, of all cases, is of prime importance to the sanitarian. Earlier diagnosis can be made by blood cultures than by the agglutination test, or by clinical signs.

4 The diagnosis of mild and ambulatory cases is of the greatest importance for the sanitarian.

5 In time of war, when we have to deal with large numbers of new and untrained men, vaccination against typhoid, of the entire army, is the most promising way of keeping down the non-effective rate due to this disease.

[1] Vol. xxiv, p. 518, June, 1909.

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6 In time of peace, especially before the summer maneuvers, as many volunteers as possible, from the Hospital Corps, should be vaccinated.

7 Vaccination should not be confined to the Hospital Corps, but an opportunity should be offered to every one in the service to be vaccinated.

8 This procedure has already been carried out on 35,000 men, without any untoward result whatever and with magnificent results as regards protection.

The propaganda progressed slowly but surely, volunteers throughout the service submitted themselves willingly and, in course of time, so many were protected that a decided impression was made on the morbidity rates of this once dreaded disease. Finally convinced, the War Department issued orders requiring recruits to be immunized and, at length, with the mobilization of 1916, antityphoid vaccination was made compulsory for all, with the result that typhoid was practically non-existent among the troops on the border.

Then came the call to the nation to arm and, even now, many hundreds of thousands of our citizens are assembled in various camps scattered broadcast over the country; young men, the flower of the race, and at the most susceptible ages for typhoid fever. *But there is practically no typhoid in our camps.*

Surely there must be some special cause for this. Nothing in the current history of existing camps would lead us to believe that in them could be found any intrinsic reason for the absence of typhoid. No doubt the army generally, and the public, have advanced somewhat beyond the ideas of 1898. There has been a great campaign of education since then, both within and without the service; still measles and pneumonia, meningitis *id genus omnes* are in the camps, but not that most dreaded of all camp diseases—typhoid. Why? Because Russell had the vision, training, ability and persistence which enabled him to convince our military authorities, and finally the people, that antityphoid vaccination, properly conducted, would eliminate typhoid fever as a nosological entity.

Let us for a moment assume that such elimination had not taken place, and the personnel of the Army was equally susceptible to typhoid as before the requirement of antityphoid vaccination, what would probably have been the present condition in our camps?

The admission rate for typhoid for our army in 1898 was 141.59 per thousand. It is reasonable to assume that this does not represent the real typhoid incidence, admission rate being an uncertain diagnostic quantity. But the average admission rate for the decennium would be a fair index and that was, in round numbers, 21 per thousand. Assuming that sanitary progress had been so general throughout the country since 1898 that, even had there been no antityphoid vaccination,

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the typhoid incidence in our camps would be 21 per thousand—a modest assumption—we would today be treating approximately 21,000 cases of typhoid fever in our military hospitals, of which 2,100 would die.

That we are not treating many more thousands than this estimate and that the usual percentage of such cases have not died is, in the opinion of THE MILITARY SURGEON, wholly due to compulsory anti-typhoid vaccination in our Army.

The Medical Department of the Army was the moving factor in producing this beneficent result, which has already added thousands to the fighting effectives of our forces, and Col. Frederick F. Russell, M.C., U. S. Army, furnished the impulse which led to the introduction of antityphoid vaccination as a compulsory practice in our service. This practice is now, slowly but surely, extending to the civil population and, in due time, typhoid will cut no greater figure in our mortality statistics than does smallpox.

Certainly Russell deserves well of his country, and a thoughtless, though really grateful, republic should acknowledge its deep obligation to him in some substantial way.

THE MILITARY GENERAL HOSPITAL IN WAR TIME

The Manual of the Medical Department sets forth, among other reasons for the organization of general hospitals in peace times, the formation of "a nucleus for the development of the larger hospitals required in the home territory in time of war." The regulation might well have read "nucleoli," for two permanent army general hospitals, accommodating possibly five hundred patients, must now expand into hospitals to care for several hundred thousand patients.

The Medical Department is, as rapidly as may be and almost entirely dependent upon construction (a function of the Quartermaster's Department), organizing accommodation for our prospective patients into units of a thousand beds, and it is to the management of such a unit we would refer.

The personnel of this hospital should be approximately 50 medical officers, 166 noncommissioned officers, 234 sanitary troops, and 100 nurses (females). Quite likely there would be men attached from other branches and possibly some civilian employes—altogether 600 persons, the usual allowance for this number of beds.

The plant of such a hospital consists of fifty-two buildings, as follows:

One administration building; 1 officers' ward; 2 officers' quarters; 1 nurses' quarters; 1 eye, ear, nose and throat laboratory; 1 operating room; 1 exchange, garage, and shop; 1 eye, ear, and X-ray laboratory;

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1 hospital mess room and kitchen; 1 receiving ward; 16 single wards, of 32 beds each; 8 double wards, of 72 beds each; 3 isolation wards; 6 barracks and 2 laboratories, mess room and kitchen for personnel; 4 storehouses; 1 chapel, mortuary, and guard house; 1 laundry; 1 fire-engine house; 1 psychiatric ward; the names of which sufficiently indicate their functions.

Regulations suggest that a base hospital is to be commanded by a colonel or lieutenant colonel of the Medical Corps. Not so many of our officers, even of this rank, have had personal experience in the immediate control of 1,600 individuals and the direction of a military general hospital of these proportions. But those of the permanent force are at least trained in the principles of command.

The commanding officer, whoever he may be, is fortunate in the fact that he will not now, as in our former wars, be forced to evolve from his experience and imagination the general details of organization, as these are set forth in the Manual of the Medical Department, but he will have a stupendous amount of filling in to do before he establishes a going institution.

Of course, as everyone knows, the first thing to organize is the administration and, thereafter, to assign every individual to specific duties, establishing a well-defined line of responsibility from the commanding officer to the *n*th private.

The manual indicates some of the duties to be done and the offices to be filled, in a smaller hospital. For larger hospitals the increased responsibilities, and number of personnel and patients, would demand higher rank and more of it. The thousand-bed hospital should have a personnel, commissioned and noncommissioned, or the equivalent in the nursing force, equalling that of a regiment of infantry, viz., 50 officers and 166 noncommissioned officers. No argument is necessary to support this proposition. If 50 officers and 166 noncommissioned officers are required to manage the 1,600 well men, more or less, of a regiment, such are equally needed to care for the same number, a thousand of whom are ill; for ill soldiers require officers and noncommissioned officers quite as much as well men.

The hypothetical commanding officer is fortunate if he has the knack of fitting his personnel into congenial places and keeping it loyally interested in the work. But whether fitted or not, the work must be done and the hospital conducted upon the highest plane of efficiency. Only the best disciplined personnel can produce this result and, in a soldier organization, this discipline must be military. Every officer, man and woman, should be right up to the line every minute, neat, soldierly, polite, efficient. With such a detachment the hospital

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is bound to be efficient, but a detachment will never be efficient spontaneously; it must be made so by ceaseless effort.

The organization of the various departments, one of the most important of which is the kitchen, would follow the lines laid down in the manual, and each of these should have a duly designated responsible head, who, after he has been instructed, should be little interfered with if making good and, if not, should be relieved. This is no time to fool with inefficient material. Trained initiative should be encouraged, but it must be "trained" and the "get there just the same" way of doing things discouraged.

After the commanding officer has his hospital running to his moderate satisfaction, and this will take almost twenty-four hours daily of his time for many weeks, he will be fortunate if he has the tact and opportunity to organize the neighboring civil community into a reasonably disciplined adjunct to his command. With the adjacent citizenry at his back, there are no limits to the good that could be accomplished for his patients.

A well-ordered woman about the hospital, even though not especially trained, could be a mighty help and, before the war is over, we will need the help of all well-ordered women the country can spare. So a good understanding with the neighbors would be a real asset to a militry general hospital and might well take the form of a properly directed woman's board of visitors.

But such assets will not be available unless the community is satisfied that the hospital is efficient, and of this it cannot be unless it is convinced that the hospital staff, commissioned and enlisted, is thoroughly disciplined and loyally devoted to its work.

The endless details of interior economy will be an unceasing cause of solicitude to the commanding officer until his team is well organized and in running order, and thereafter even, will require his constant, tactful supervision.

It goes without saying that there should be a designated place for everybody and thing, set forth specifically in orders. Nothing shatters faith in such an institution more than to have an outsider inquire for a particular patient and be long delayed in ascertaining his location. A card index of patients, kept up to the minute, should always be in the information department; as should such an index of the personnel be in the personnel department. Strict care should be taken of patients, effects if scandal is to be avoided.

The hours for visiting should be prescribed and only departed from in special instances by authority of the commanding officer of the hospital, or other officer designated by him. Apropos to this the public press has

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recently dwelt upon the action of the chaplains of a certain Division in relation to the Division hospital. THE MILITARY SURGEON knows nothing of the merits of the case and regrets the occurrence. Chaplains can be made a valuable adjunct to a hospital if properly controlled; they, of course, have nothing more to do with the conduct of it than the surgeon has to do with their chapels, and it might seem that these particular chaplains should be court-martialed for conduct prejudicial to good order and military discipline. Chaplains should not be permitted to chase over the hospital at any and all times, any more than other outside officers, but should visit during the prescribed hours; unless there be a particular reason otherwise, which then should be determined by proper authority.

This incident but illustrates that the commanding officer of a general hospital (this happened to be a division hospital), among numerous other things must be "wise as a serpent," tactful to a degree, a great physician, a fine organizer and administrator, an excellent disciplinarian, thoroughly competent to run a large hotel, wholly equal to the command of a regiment, and therefore a good soldier.

Of course very few men possess all these attributes, but he who would successfully conduct a great military hospital must possess most of them, for upon him will depend 75 per cent of the efficiency of his command. "*En y pensant toujours*" was Napoleon's reply to one who asked him how he was able always to decide certain matters so quickly. An admirable motto for a general hospital commander, who should always be thinking about his command and how to promote its efficiency.

THE FOURTH TABLET

Professor Keen's beautiful tribute to the Officers of the three public medical services,[1] brings to mind the fact that there is a fourth tablet, erected in the Chapel at Fort Leavenworth, Kansas, by the medical officers of the Army. It bears a three-fold inscription:

IN MEMORY OF FIRST LIEUT. GEORGE E. LORD, ASSISTANT SURGEON. KILLED IN ACTION WITH SIOUX INDIANS, LITTLE BIG HORN RIVER, MONTANA, JUNE 25, 1876.

IN MEMORY OF FIRST LIEUT. THOS. J. C. MADDOX, ASSISTANT SURGEON. KILLED IN ACTION WITH APACHE INDIANS, WHITE HOUSE, NEW MEXICO, DECEMBER 19, 1885.

IN MEMORY OF THE ACTING ASSISTANT SURGEONS OF THE U. S. ARMY, WHO HAVE FALLEN IN LINE OF DUTY IN THE SERVICE OF THEIR COUNTRY. R. I. P., A. D. 1889.

[1] THE MILITARY SURGEON, January, 1918.

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ASSOCIATION NOTES

A meeting of the Executive Council was held at Washington, D. C., January 21, 1918, for the transaction of such business as should be brought before it.

Reports were submitted by the secretary and treasurer, detailing the work of their respective offices and showing a very satisfactory condition of the affairs of the Association.

Lieut. Col. Joseph A. Hall, M.C. N.G. U.S., was elected first vice-president to fill the vacancy in that office caused by the death of Surgeon General Henry Allers, N. J.

In accordance with a resolution adopted at the last annual meeting, accepting the principle of a proposed amendment to the constitution establishing a Sinking Fund and making it immediately effective, the following named were elected as members of the Savings Committee: The president, the treasurer, and former presidents Hoff, Wise and Blue.

The secretary submitted the applications for membership by 1,120 medical officers who had been found qualified, and who were duly elected active members of The Association of Military Surgeons of the United States, and one officer of the Sanitary Corps, associate member, as follows:

Medical Corps, U. S. Army

Major

Geo. B. Lake
John T. Reddy

United States Public Health Service

Assistant Surgeon

Charles E. Gibbs

U. S. Navy

Assistant Surgeon

C. C. Ammerman

P. A Surgeon

Reynolds Hayden

Surgeon

Harold D. Meeker

National Guard (U. S.)

Major

Edgar C. Barnes
John M. Birkner
John Russell

Captain

John E. Armitage
Harry J. O'Bryan
Robt. W. Blumenthal
Neil McLean

First Lieutenants

Lee B. Greene
D. L. Hibberd
Johnston H. Kerr
Chas. E. Schwartz

Associate Member

Captain

John K. Reinoehl

Medical Reserve Corps, U. S. Army

Majors

Francis J. Adams
Walter M. Brickner
Lloyd V. Briggs
Thomas J. Burrage
Roy B. Canfield
Robert H. Duenner
William T. Elam
John B. Elliot
Arthur W. Elting
J. Birney Guthrie
Robert H. Halsey
W. W. Hamberger
Seale Harris
John R. Hereford
Christian R. Holmes
Walter A. Jayne
Kerwin W. Kinard

Majors—con't.

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Howard Lilienthal
Mark E. Lott
William H. Luedde
Thomas R. Marshall
Guthrie McConnell
Irvy L. McGlasson
Alexander Nicoll
F. W. O'Donnell
Harry R. McKellar
George Osgood
Daniel M. Ottis
Francis W. Palfrey
Nelson M. Percy
Reuben Peterson
W. H. Rockwell
Llewellyn Sale
O. M. Schwerdtfeger
John M. Swan

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Majors—concl'd.

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W. F. Wesselhoeft
William H. Wilder

Captains

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J. Newton Alexander
A. Alguire
Ira A. Allen
Lewis M. Allen
Jere A. Allis
Harry M. Andrson
Henry G. Anderson
Carl Aschenbrenner
Reuben J. Atwood
Arthur C. Bachmeyer
Alfred E. Bants
Fred W. Barger
Stephen H. Baxter
Lynn S. Beals
A. J. Benedick
Gordon Berry
William H. Bets
John A. Borts
Fred P. Bowen
Albert J. Bower
Harry Brady
Frank W. Brodrick
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Henry R. Brown
Claude P. Brown
Edwin T. Bruce
Edmund R. Brush
Frank D. Burgess
Victor Cadwell
Herbert Caldwell
Charles E. Cantrell
Paul F. Cavanagh
Orville R. Chadwell
Louis H. Chamberlin
Henry M. Chapman
Miles D. Chisholm
C. R. Christenson
Orton H. Clark
I. Ross Clark
Joseph J. Clarke
William F. Clary
Mitchell C. Clokey
Arthur L. Cludas

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Thomas K. Conrad
W. W. Cornog
John E. Countryman
Sylvester D. Craig
William H. Crowell
Murdoch Lee Crum
Clyde L. Curll
Thomas B. Curran
William T. Daly
Albert K. Detwiller
William W. DeWolfe
Charles T. Dulin
William H. Dunham
Frederick Dunn
Richard G. Eaton
Samuel I. Eber
Carl Eggers
Francis J. Eisenman
James F. Elder
Roderic S. Elliott
John Dean Elliott
Charles E. Elliott
John A. Farrell
Erasmus D. Fenner
Roy R. Ferguson
Frederick A. Fisher
James P. Fiske
Aloysius S. Fleming
Howard Fletcher
Joseph F. Fogarty
John T. Foley
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Eugene Gates
Kenneth D. Graves
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Myron S. Gregory
William E. Ground
Milton W. Hall
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Geo. McC. Hamilton
Logan O. Hamilton
Robert B. Harkness
A. M. Harrelson
Luther S. Harvey
Leonard F. Hatch

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W. C. Humphries
Frederick A. Hunt
John W. Hunt
William M. Hunter
Charles W. Hunter
George G. Hunter
Meredith W. Hyatt
Otto B. Ilch
Edward S. Imel
Harry A. Jefferson
William E. Joiner
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R. D. Kennedy
Calvin M. Kessler
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Francis La Piana
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Wesley T. Lee
Robert F. Leinbach
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Horace Luten
James A. Lynch
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Henry H. Malone
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Greene Day McCall
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James N. McCoy
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James McD. Patton
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Gentz Perry
Stephen W. Perry
Cyrus L. Pershing
Edward H. Pershing
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Barrick S. Rankin
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Paul F. Rice
Wm. W. Richardson
Levi Lore Riggin
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W. H. Roberts
Harvey H. Roberts
G. Wilse Robinson
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Kennedy F. Rubert
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French Austin Smith
Carl J. Snitkay
Max Staehle

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Kenneth B. Turner
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Francis M. Vessells
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Walter H. Vosburg
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Ben S. Walker
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Ellis H. Whitehead
Walter E. Whitney
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C. W. Wilkowske
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Horace P. Wilson
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Howard J. Wright
Harry G. Wyer

Medical Reserve Corps (U. S. A.)

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J. S. Alexander
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Maury Anderson
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Jesse M. Anderson
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G. H. Applewhite

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Geo. W. Green
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Clare H. Hanley
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Robinette B. Hayes
Louis H. Hayes
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J. M. Henderson
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Charles L. Housel
William P. Howard
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Jesse B. Howe
Heister V. Hower
Edgar B. Howell
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William M. Hubbard
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Solon R. Humphries
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Harley D. Newby
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John H. Nichols
R. M. Nicholson
Julius W. Nieweg
Warford L. Nixon
John H. Norrick
Jesse L. Norris
Carl W. Norwood
John K. Norwood
Geo. E. Nye
Bert F. Ober
Francis J. O'Brien
John O'Brien, Jr.
Patrick J. O'Dea
Chas. T. Olcott
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Philip Pearlstein
William W. Pearson
J. H. Peck
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Reece M. Pedicord
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Samuel Perlman
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Bruce M. Phelps
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Creswell T. Pigot
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Howdin Walker	Wm. L. Welsh	Warren M. Wier	Richard Yellott
Conrad Wall	Timothy D. Welsh	William S. Wiley	Ivan I. Yoder
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Robert G. Ward	John P. Wheeler		

SURGEON GENERAL THOMAS H. GOODWIN, R. A. M. C.

THE MILITARY SURGEON extends its congratulations to an Honorary Member of The Association of Military Surgeons U. S., a distinguished representative of his own service, and a medical officer *par excellence*, upon his well-earned promotion as Deputy Director General, R. A. M. C.

General Goodwin, early in his military service, which began in 1893, earned the D. S. O., an auspicious beginning foreshadowing a career which for twenty-five years has been an inspiration to all medical officers. During the present war our colleague has demonstrated his possession, as well, of high administrative qualities, which have received recognition by decoration and promotion and have placed him among the first of his corps.

All these honors we glory in, especially because we know him and regard him as a personal friend and comrade, who has shared our thoughts and aspirations, who has helped us by his modestly given advice, so professionally sound, and by his soldierly example.

The pages of THE MILITARY SURGEON bear evidence, in papers which General Goodwin has so kindly contributed, of the impetus he gave to medico-military organization and efficiency in our Department, during his sojourn in the United States, an impetus which has placed all our people, and especially his fellow-members of The Association of Military Surgeons of the United States, under obligations to him.

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COMMENT AND CRITICISM

THE REPORT OF THE SURGEON GENERAL, U. S. ARMY, 1917

The one-hundredth consecutive annual report of the chief of our Army Medical Service has just reached the editorial desk and stands *facile principes* amidst its century of fellows.

The delay in its appearance, due to causes which are obvious, has whetted our anticipation and the realization has quite equalled our expectations. This book is a liberal education, and should be placed in the hands of every medical officer with the admonition to "read, mark, learn and inwardly digest" its informing contents.

It will be recalled that the report covers the calendar year 1916 (and the fiscal affairs of the Department to June 30, 1917); it therefore embraces an account of the exceedingly valuable experiences gained during the general mobilization at the border.

THE MILITARY SURGEON often wonders if our people realize how priceless to our country that experience was. There are some rumblings and groanings amidst our nation in arms today, but in comparison with what there would have been, save for our border experience, they are but a gentle lullaby to the roar of a stormy ocean, so smooth was the transition from a state of profound peace to that of active warfare. Moreover, the work of the Medical Department was a large factor in smoothing the way and the report well says: "The services rendered by the officers of the Medical Corps have been highly satisfactory in all respects, administrative as well as professional, and have entirely justified the commendation made by their superiors, in official reports," special emphasis being placed on the results accomplished by the medical officers, regular, reserve and militia in Mexico and on the border.

To the great war there is but a pointed allusion. The declaration came April 6, 1917, shortly after the close of the period covered by the report, and fortunately found the Medical Department with its plans for mobilization well in hand. The report gives "as evidence of the unprecedented expansion of the activities of the Medical Department of the Army" that, at the date of going to press, "there were more than 13,900 officers engaged in the work of the department, including those of its various corps," and held out the prospect of many thousands more before the conflict ends.

Notwithstanding the more than doubling of the numbers of individuals upon which the statistics of the Surgeon General's Office are

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usually based, it appears that the health of the forces was quite up to the standard recently established in our service.

The mean strength of the command was 176,803; its constantly non-effective rate was 24.26 per thousand, of which 20.55 was for disease, *slightly below that for the previous year* of profound peace. The death rate was 4.39 against 4.45 for the year 1915, the discharge rate higher—15.22 compared with 14.06; and the admission rate also higher—858.87 and 726.22.

While no widespread epidemic occurred anywhere in the command, wholly due, we believe, to the fact that there were trained medical officers on duty in all administrative positions, there were local threatenings and outbreaks, prototypes of the larger threats now making and due to like causes. Typhoid and its fellows, malaria and variola, are no longer the dread of the military sanitarian, as evidenced by the report. Measles and its sequelae are still with us, demanding their toll, and the hookworm is here to help them along. One thing this war will certainly do: it will enable several hundred thousand of us to get rid of the long entertained ankylostoma and maybe influence our civilian friends to do likewise.

As stated in a previous review, the Army and Navy have probably reached the irreducible minimum in non-efficiency due to venereal diseases. Our forces come from the people and, if half the people are venerealized, which seems to be the case, we can't hope to more than half reduce the civilian rate, in our services. The report expresses the hope that "recent legislation giving to the Secretary of War and the military commanders authority to control . . . the civil community adjacent to army commands, in all matters relating to prostitution and the sale of alcoholic drinks, will do much to bring about the desirable conditions long sought for by army sanitarians." Perhaps so, nothing in history justifies this hope, or the neglect of the prophylactics thus far so successful in reducing military non-efficiency from venereal diseases to the present minimum.

The account of the administrative, supply and educational activities of the department is interesting and inspiring. "The Army Medical School has had the most important and successful year in its history and has experienced a development and expansion quite beyond the thought and purpose of its founders." THE MILITARY SURGEON can heartily endorse the statement that this admirable organization has proved its value to the country and "the Government should no longer hesitate in providing it a permanent and modern home of its own—one that might quite possibly, with advantage, be made sufficiently large to house also the library of the Surgeon General and the Museum."

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What an opportunity for some philanthropist to build himself an enduring monument like unto that of Smithson!

We would go even further and say that such a combination would be immensely advantageous to the Medical Department, the profession and the country. With our present organization, our school must be extended to embrace professorships in military dental and veterinary medicine as well, with laboratories for these specialties. Then, too, the Museum should grow stupendously in extent and worth, as the result of the present war, while the library must keep pace with it in every respect.

The Library of the Surgeon General's Office is now really an international institution, its index catalogue, up to the minute, is indeed the index of every medical library extant and is invaluable to the profession everywhere, while its books, the largest collection of medical literature in the world, are available to all, under the simplest restrictions. Surely these invaluable collections should not be housed inadequately or subjected to the risk of irreparable loss by fire.

The report refers, necessarily briefly, to the valuable work which has been done by our medical observers abroad, which has proved "of great assistance to the War Department and of particular advantage and satisfaction to the Medical Corps."

THE MILITARY SURGEON shares the regret of the Surgeon General that more medical officers "could not have been spared for duty abroad in the early months of the war." Most useful experience might have been gained by a considerable number of our officers through attachment to Red Cross Units, had the authorities but authorized it. Many valuable papers have been received from our observers, of which THE MILITARY SURGEON has been permitted to publish some and wishes it might be allowed to publish more.

The great lesson of the report is found in the documentary history of the mobilization of 1916, and the Mexican expedition, particularly the former, for the experience gained there, as previously stated, has proved an invaluable asset, in the far greater mobilization of 1917. Indeed it probably hastened its full consummation by a year.

We would wish to go deeply into the details of this history, to discuss the immensely instructive reports of the principal medical officers, to bring to the attention of our readers the wealth of experience therein set forth, but to do so would detract from them, for they must be read in entirety to appreciate their full value. The statistical tables of the report, which show a distinctly satisfactory state of health in the services, are particularly valuable at present, in determining a standard for the

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years of active warfare now before us. The only element in which we must look for a material change is in wounds of war.

By the way, let us hope that our statisticians will refrain from any comparison between wound statistics and those of disease; they bear about as much relation to each other as a "green cheese" does to the moon. Originally introduced, before physicians were authorized in armies, to convince the authorities that disease is quite as large a factor in military non-efficiency as wounds, and that, therefore, it is quite as necessary to employ physicians in an army as to employ surgeons, it has been used, in modern times, chiefly as a scourge to apply to the long-enduring back of the Medical Department because of its inability either to induce the fighting department to get into the fighting game, or to properly care for their men when not fighting. Of course there is absolutely no common ground of comparison between the two causes of non-efficiency; both are inevitable and our only ambition should be to reduce them to the lowest possible limits consistent with the accomplishment of that for which an army exists, *i. e.*, to conquer the enemy—such reduction in disease seems to be approximated in our army today.

The following table (page 201) epitomizes the nosological history of the entire army for the calendar year 1916:

On June 30, 1917, the Medical Department of the regular establishment totaled 23,199 persons, commissioned and enlisted, of whom 3,636 were officers of the M. R. C. on active duty. Of the National Guard on August 3 there were 1,848 officers of the Medical Department, of whom 1,407 were medical officers. At the date of promulgation of his report the Surgeon General remarks, as previously stated, "that at this time there are more than 13,900 officers engaged in the work of the department." Nor is this all, for General Gorgas expresses the opinion "that at least 24,000 physicians will be included in the personnel of the Medical Department of the Army when full strength is attained"—five times as many as were in all branches of the entire Regular Army at the beginning of the war. Even yet the story is not told, for the enlisted strength of the Medical Department, to correspond to this number of officers, will be over one hundred thousand sanitary troops.

It is of vast importance that this fact should be deeply impressed upon the minds of our countrymen.

What the training of such a force involves can only be appreciated when it is understood that these officers and men must be trained equally intensively with those of other branches of the Army. The medical officer and the sanitary soldier are a military part of a military body, with special function. There are certain prerequisites to officership in this body, its officers must be physicians to start with; just the

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ADMISSIONS TO SICK REPORT, DISCHARGES, DEATHS, AND NON-EFFECTIVENESS WITH RATIOS PER 1,000 OF MEAN STRENGTH, FOR THE ARMY, CALENDAR YEAR 1916

International classification		Army (entire), officers and enlisted men (including Porto Rican troops and Philippine Scouts).							
	Mean strength	S. G. O., 110454—A. G. O., 110875.							
	Causes of admission to sick report	Admissions		Discharges		Deaths		Noneffective	
		Number	Ratio	Number	Ratio	Number	Ratio	Number	Ratio
	DISEASES AND INJURIES GROUPED								
	General diseases	24,000	217.28	495	4.68	122	1.10	1,151.76	10.39
1–19	Epidemic diseases	10,670	95.59	16	.15	31	.28	296.50	2.67
20–59	Other general diseases	13,330	120.68	479	4.53	91	.82	855.27	7.71
	Diseases of the nervous system and organs of special sense	3,572	32.34	483	4.57	24	.22	240.99	2.17
60–74	Of the nervous system	1,625	14.71	422	3.99	24	.22	168.61	1.52
75	Of the eye and its annexa	1,217	11.02	34	.32	.....	.....	43.73	.39
76	Of the ear and its annexa	730	6.61	27	.26	.....	.....	28.65	.26
77–85	Diseases of the circulatory system	2,393	21.66	86	.81	31	.28	131.17	1.18
86–98	Diseases of the respiratory system	6,301	57.04	42	.40	50	.45	158.00	1.42
99–118	Diseases of the digestive system	18,948	171.55	84	.79	45	.41	415.24	3.74
119–127	Diseases of the genito-urinary system	1,269	11.49	60	.57	21	.19	66.41	.60
142–145	Diseases of the skin and cellular tissue	6,080	55.05	12	.11	2	.02	158.14	1.43
146–149	Diseases of the organs of locomotion	2,869	25.97	211	2.00	.....	.....	149.97	1.35
150	Malformations, etc	365	3.30	3	.03	.....	.....	12.14	.11
154	Diseases, results of old age	3	.03	.....	.....	.....	.....	.18	.00
189	Ill-defined diseases	919	8.32	1	.01	5	.05	24.93	.22
	Total for disease	66,719	604.04	1,477	13.97	300	2.71	2,508.92	22.63
155–186	External causes	13,520	112.40	212	2.01	275	2.48	483.13	4.36
	Total for disease and external causes	80,239	726.45	1,689	15.98	575	5.19	2,992.05	26.99

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same as in the Engineer Corps, its officers must be engineers, but that is only to start with. After that they must be taught to be soldiers, so that among other things they may teach the thousands of enlisted sanitary personnel, who have no preliminary qualifications, to be soldiers. It takes no less skill and time, indeed more, to make an efficient sanitary soldier than to make a line soldier, and all this is the task the less than 500 permanent medical officers had thrust upon them.

"Stop, Look and Listen," ye people! In an army of like numbers of fighting troops, which was the strength of our whole army when this war began, the law provided eight major generals and seventeen brigadier generals of the line, not to mention two major generals and nine brigadier generals of the staff, not because they are ornaments, but because they are deemed necessary. If such were really necessary in the one case, they are equally so in the other. The American people demand of their soldiers efficiency, for nothing inefficient is worth having. They do not now know that an efficient sanitary force is essential. They do not now appreciate that such a force, to be efficient, must be thoroughly trained as soldiers. Presently they will know these facts, possibly through a costly lesson; then, being just as well as generous, they will say that, to promote the efficiency of the service, the rewards to the sanitary forces shall be made coequal with those of the other branches. Such is not now the case. It has been asked: Will rank make us better doctors? No. But why, then, will it make better engineers?

The scheme of intensive education carried on by the Medical Department in the field has been fruitful in results. It was begun during the mobilization, and the details of it are set forth in the Surgeon-General's report. THE MILITARY SURGEON feels that it has a direct part in this, as the plan was largely due to Col. E. L. Munson, the editor. This plan was developed and adapted to the curriculum of the medical officers' training camps which have been so successfully conducted since the declaration of war.

Too much stress cannot be laid on the education of the sanitary personnel, even in the smallest details. Of course most of us are not to the military manner born, but we can acquire the "manner" by reasonable effort. In making this we should realize that the aggregation of innumerable small things makes great things, and each element is a factor in the result, be it good or bad. Even the manner of saluting is an excellent index of the training and discipline of the soldier, officer or man.

We might go on indefinitely reviewing this invaluable report, and then not come anywhere near doing it justice. This requires that it be carefully read and studied. To this end we heartily repeat our recommendation that a copy of the Surgeon-General's Report, 1917,

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be sent to every medical officer and that it be made a text-book in our camps of instruction.

In closing this inadequate review, The Association of Military Surgeons, U. S., we are sure, would thank the Surgeon General for his kindly notice of its journal. The ambition of THE MILITARY SURGEON is to help in the herculean task our country has undertaken, by bringing before the membership the best current thought in military medicine, and commenting upon it, sometimes critically perhaps, but never in the spirit of destructive criticism.

THE MEDICAL DEPARTMENT OF THE NATIONAL GUARD

The annual report of the Chief of the Militia Bureau opens with an interesting résumé of the history of the movement, really begun in the last decade of the last century through voluntary coöperation, which has finally resulted in making the state forces a dependable part of the National Army. We refer the reader to the report for details of this and other interesting matter set forth therein, and turn to that which most concerns us, the chapter on sanitary troops.

The report notes the fact that, during the year, 21 field hospitals and ambulance companies and 93 detachments were organized, which, together with those previously organized, made a grand total of 59 field hospitals, 47 ambulance companies and 267 detachments, drafted into Federal service. This leaves a deficit of 5 field hospitals, 17 ambulance companies, and 22 detachments to be made up from the selected troops. The 5th, 6th and 7th Divisions from the northeastern section, the 12th Division from Illinois, and the 17th Division from Kentucky and Indiana were the only ones of the twenty divisions which had a complete sanitary organization.

One thousand four hundred and seven medical officers, three hundred and seven dental officers, and eighty-one veterinary officers, in all 1,848, were recognized by the bureau as eligible for transfer to Federal services, of whom about half have had previous service, a deficiency of 60 officers. The administrative and reserve officers were not drafted, not being included in the President's call. There were approximately 19,000 sanitary troops, exclusive of officers.

The prescribed theoretical course of instruction was carried out in the armories, as well as could be, under the peculiar circumstances of the year—257 medical officers and 762 enlisted sanitary troops, not on duty on the border, were called into Federal service in June and assigned to duty for instruction at the three Medical Department training camps, as was a field hospital and an ambulance company to each of the camps.

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The report shows an interesting contrast between the number of all arms of the service, rejected on account of physical deficiencies in the mobilization for border service, 18.45 per cent, and that a year later, for war, 9.9 per cent, a clear indication that the medical officers of the National Guard knew at least 50 per cent more as to the physical standards for enlistment in the army than they did before mobilization. It is to be regretted that they did not make it 100 per cent. Yet this was hardly to be expected with a fourth of them without previous military service.

The report states that 65 sanitary formations "were supposed to be fully equipped and had animal-drawn transportation." These certainly were a valuable asset and must have been a great help in meeting the early exigencies of mobilization. Forty-one formations were, as previously stated, organized at the time of the draft and were not immediately equipped.

The matter of equipment, clothing, etc., is always a subject for discussion at this period of a war, in countries which regard war as they do famine or pestilence—something to be provided against when it comes. Nor do the people seem to understand why there is a dearth of these things when "a million men spring to arms over night." The departments can and do, in reasonable time, accumulate just as much equipment as Congress authorizes and provides the money for, and no more. Unfortunately, clothing, blankets, rifles, ammunition, barracks, and the endless number of things an army requires, do not spring into existence with the same celerity that "men spring to arms." These things require more time than "over night." Congress failed to make provision for them in time, consequently they were not provided and ready, in abundance, at the beginning of the war.

If the people have fault to find because our Army was not equipped "over night," let us blame ourselves for not providing against the contingency of war, an ever-present contingency.

In the meantime we have taken off our coats and are working, men and women alike, to remedy our lack of foresight, and are gradually doing it. Our Army is being equipped and trained and transported and soon will be doing what it was raised for—driving the Hun back to Berlin.

Following the example of the stage manager who requested the audience not to shoot the actor, "as he is doing his best," don't let us throw bricks at the War Department, which is doing its best—and a very good best—with a huge job our lack of foresight has thrust upon it.

The National Guard has already proved a valuable asset to the country and, continuing such, will leave its mark deeply graven, when the history of its share in this war comes to be written.

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REPORT OF THE SURGEON GENERAL, U. S. NAVY, FOR FISCAL YEAR 1917

This report is particularly interesting, covering as it does a period of active preparation and rapid expansion of the Medical Corps of the Navy—in personnel, hospital and ship construction and equipment. The first few pages are devoted to the personnel of the corps and the efforts made to increase it as rapidly as possible. A very energetic publicity campaign is described to secure more material from civil life to reënforce the Medical Corps.

The remarks on the necessity of some knowledge of service conditions and methods, to make, out of a civilian practitioner, an efficient medical officer, are very timely and well put, and apply to all branches of the service. The response to the appeals of the Surgeon General of the Navy, by civilian physicians, for active duty in the Naval Medical Reserve Corps, has apparently been very gratifying.

Then follow a few paragraphs on the Red Cross activities as auxiliaries to the naval medical equipment—five Navy Base Hospital Units manned and equipped by the Red Cross, and their location, are noted as well as the smaller units for duty with new temporary hospital construction at Naval hospitals and stations—120 additional commissions in the Naval Medical Reserve Corps have been issued for the surgeons attached to these units. A great deal of valuable work for the Navy hospitals is being done by women—under Red Cross direction—in the making of surgical dressings, the Navy supplying the material, the women giving their time and services without remuneration. Very valuable material is in this way supplied and much time saved to the men of the Hospital Corps.

The report then takes up the subject of activities connected with war service and emergency hospital construction—giving in some detail the rapidly constructed additions to existing Naval hospitals. An aggregate of 10,000 beds is contemplated and the work is progressing satisfactorily. This does not include the hospitals at the large training stations.

Then follows a brief discussion of the contagious diseases—inseparable from mobilization—a serious matter demanding constant vigilance, skill and experience in sanitation, to be properly handled. The question of segregation of recruits in detention camps for three weeks is discussed. It is considered absolutely necessary to establish and maintain such camps, to avoid the wide spread of contagious diseases in the training camps. The methods recommended for the management of these detention camps are discussed in some detail. The necessity of well-equipped laboratories in each training camp is very properly insisted upon.

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The connection of the Medical Corps of the Navy with the General Medical Board of the Council of National Defense is discussed. The question of standardization of medical and surgical equipment and supplies—a very important matter—is also taken up.

Several pages of the report are devoted to the expansion and training of the Hospital Corps—suddenly increased from 1,585, all ratings, to 6,000—the enlargement of the already existing, and the establishment of new, training schools. The course has been unavoidably shortened from six to three months, but the work is being done very energetically and successfully. The same is true in a lesser degree of the Nurse Corps.

Then follow some notes on the estimates and appropriations for the Medical Corps of the Navy, and on Medical Supply Depots. Pages 31 to 52 are devoted to the work of the Division of Sanitation, Sanitary Conditions and Measures Afloat—Hospital and Ambulance Ships—Sanitary Conditions Ashore in stations at home and beyond the seas.

There is a brief but interesting report on recruiting, with percentage of, and causes for rejection. This is followed by a very complete and well tabulated report of the health of the Navy, with a detailed statement of all diseases and injuries reported in the calendar year, 1916.

Altogether, in view of the rapid expansion of the Navy, the sudden change from peace to war conditions, this report is particularly interesting and instructive.

WM. H. ARTHUR.

THE ANNUAL REPORT OF THE SURGEON GENERAL OF THE PUBLIC HEALTH SERVICE OF UNITED STATES FOR THE FISCAL YEAR 1917

The forty-sixth annual report of the Surgeon General of the Public Health Service, dated Washington, D. C., 1917, appearing before us in book form and covering in all 357 pages, is a simple, straightforward story, tersely told, of duties faithfully performed, of work well done.

We are told that "the administrative organization of the bureau has been the same as heretofore." From this we must infer that the organization, resisting, as it has done in all these years, the inroads of changed conditions, must, from its very beginnings, have possessed the elements necessary for an enduring life.

The seven divisions through which the bureau conducts its work are the following: (1) Scientific Research, pp. 15-17=57; (2) Foreign and Insular (Maritime) Quarantine and Immigration, pp. 72-187=116; (3) Domestic (Interstate) Quarantine, pp. 182-253=172; (4) Sanitary

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Reports and Statistics, pp. 254-308=55; (5) Marine Hospitals and Relief, pp. 309-316=18; (6) Personnel and Accounts, pp. 317-32=37; and (7) Miscellaneous, pp. 324-328=5. The remaining space is covered by statistical tables, a sketch of the "*Needs of the Service*," and the Index.

The number of pages devoted to the respective divisions may or may not indicate the relative importance attached to each one by the bureau.

On reading the different paragraphs appearing under the heading: "*Scientific Research*," some of us, having lived long enough to watch and observe, with the greatest interest, the origin and growth of the hygienic laboratory, from small beginnings to its present size and world-wide influence and scientific reputation, might perhaps be led to form the mistaken impression that the laboratory had been relegated to a position of less importance than it occupied in former years. The significant fact, however, is becoming more and more apparent, as time goes on, that the term "research work" can no longer be exclusively applied to work turned out by laboratories. Field work, as performed by the officers of the service, is research work and its unsolved problems are, today, as varied and as wide as are the vast areas of our country. Such work, even regardless of its important special practical value to the country and its people, signifies a very natural and necessary extension of the scope of the laboratory—a quite normal but progressive evolution of its ever varying functions! The field, in public health work is the place where the results of the training of investigators in scientific methods, in accuracy and thoroughness of observation, obtained and acquired in the school of the laboratory, must be tested as to their value, checked as to their reliability, in the numerous and varied attempts at the solution of the more practical health problems presented. Strategic planning and tactical performance are as necessary for success here as elsewhere. Coöperation here, as elsewhere, is the soul of efficiency. These things seem to have been recognized by the head of the service.

Consequently, after war had been declared and it had become necessary for a large portion of the personnel of the service officers, specialists in the various branches, to be transferred to survey work and other important war duties, the Government did not find the service unprepared to meet the extra exigencies placed upon it by war conditions; it was, on the contrary, found that the very work in which many of the officers had been engaged for years preceding the outbreak of the war—viz., in malaria, typhoid fever, rural sanitation, public health organization and administration and pollution of streams—amounted for them to a very desirable preliminary preparation and was of the most direct value in the making of such surveys of cantonments as it had become imperative to make at the outbreak of the war.

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Field and laboratory investigations are discussed, in the report, under the following headings: (1) Surveys of the sanitary conditions and needs of extra cantonment areas; (2) diseases of man, including cerebrospinal meningitis, diphtheria, malaria, pellagra, poliomyelitis, scarlet fever, trachoma and typhoid fever; (3) occupational diseases and industrial hygiene, including health insurance; (4) public health organization and administration; (5) school hygiene; (6) rural sanitation; (7) pollution of streams; (8) pollution of coastal waters; (9) industrial wastes; (10) sewage disposal, and (11) viruses, serums, toxins and analogous products.

There is one disease, among the many, mentioned in the report, the story of which appeals especially to the reviewer, and perhaps also to the the reader of these lines, namely, "*trachoma.*" This disease, though present in other states, is most prevalent in some of the southern states, notably Tennessee, Kentucky and Arizona. It appears that the Public Health Service has been at work trying to eradicate this disease for the past three years and has, among other things, established six hospitals for this purpose. "The total attendance at those hospitals during the year was 18,430, and the total number of individual treatments was 127,914. One-half of the trachoma cases applying at the hospitals for treatment were found to have defective vision as a result of this disease. This impairment of vision ranged from comparatively slight defects to total blindness." With regard to the "*effects* of trachoma," the report says: "While blindness often results from trachoma, it is now recognized that this is only one, and possibly not the worst, feature of the disease. We know that it lasts for years with constant irritation and discomfort to the patient, impairing his earning capacity . . . ruining life and happiness of entire families, and finally terminating in total blindness. After nearly a lifetime of misery, the patient is often dwarfed in mind and warped in body with trichiasis, entropion and other sequelae still remaining to harass and irritate the sightless eyes." With reference to the relation of the disease to war, the report states that "it has been reported that an epidemic of trachoma is causing considerable anxiety in France, the disease having been brought to that country by African soldiers and laborers" and points out the necessity for an examination of the eyelids of all recruits and applicants for the service, coming from districts infected with the trouble. This precaution is said to be particularly applicable to some of the southwestern states, where the disease is known to be endemic and where it is likely that trachomatous persons will congregate in the vicinity of military cantonments. This is the pathetic story of a disease, comparatively little known on the part of the profession at large!

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A notion of the extent to which "*Maritime Quarantine*" engages the Public Health Service may be formed on reading the following figures: "At the various national quarantine stations on the mainland of the United States, there were inspected 12,431 vessels and 709,770 passengers and crew. At the foreign and insular ports, service officers inspected 5,834 vessels and supervised the fumigation of 1,897 vessels . . . The grand total of passengers and crew inspected was 1,348,847 and vessels fumigated 4,693." Incidentally the results of fumigation directed against rats turned out to be in favor of the efficiency under certain conditions of cyanide gas rather than sulphur dioxide and since the promulgation of "*Safeguards to be Observed in Performing Fumigation with Hydrocyanic Gas*," by Surgeon General Blue, no accidents attributable to cyanide fumigation were reported up to the end of the year, although, approximately, 900 ships had been so treated!

The very excellent account given in the report, under "*Domestic (interstate) Quarantine*," of the measures for the control of the interstate spread of poliomyelitis at New York City, taken by the service, makes rather mpressive reading not only for those unacquainted with the systematized efforts which it is usually necessary to make for the suppression of communicable diseases during epidemics, but also for the general health officer outside the service. This particular epidemic required the adoption of such radical and unusual methods for the enforcement of quarantine measures, on account of the fact that "from the very onset of the epidemic a feeling of apprehension, if not of actual alarm, prevailed throughout the country, even in communities altogether remote from the centers of infection. The work accomplished shows the great value of trained health officers of the service as well as the great importance of a responsive coöperation of local health officers of experience. Under the system adopted, travelers were no longer subjected to unnecessary inconvenience, amounting sometimes to positive hardship, but were protected from it.

"Through the division of '*Sanitary Reports and Statistics*' the public health service keeps itself informed of the occurrence of outbreaks and epidemics and of the prevalence and geographic distribution of preventable diseases, makes disease maps, keeps cognizant of current sanitary legislation through the collection and compilation of state and municipal laws and regulations and court decisions on matters relating to public health, and publishes weekly the Public Health Reports." The report is full of information, not ordinarily found in current medical literature, and should be widely read.

A government service that can look back upon a life of uninterrupted usefulness of one hundred and nineteen years; that has passed

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through the storms and stresses of all these years unscathed; that has stood the test of time and of the never-ceasing changes of conditions and of the demands placed upon it and grown stronger with every succeeding year, can only seek and find the natural causes for its survival, its *raison d'être*, in (1) the unquestioned and absolute necessity for its existence to the state, and (2) in the soundness of its organization, its remarkable adaptability under trying circumstances, and its liberal and judicious administration. Such a service ought, therefore, as a quite natural sequence, to have its expressed and ever-increasing "*Needs*" attended to by an equally liberal and indulgent government, inasmuch as these must arise, in an ever-increasing measure, in its further growth from year to year.

H. G. Beyer.

DESCRIPTION OF DETENTION CAMP ERECTED AT NAVAL TRAINING CAMP, SAN DIEGO, CALIFORNIA

1. The location chosen for this camp is situated on the eastern side of the exposition street formerly running through the Amusement Concession and called "The Isthmus." It is opposite and just above the Isolation Camp and 200 yards north of the Station Hospital.

2. The general plan of this camp is as per appendix "A." Total length, 498 feet; total width, 230 feet. The camp is arranged in four sections, each section being equally subdivided into four smaller divisions or "paddocks," 110 feet by 56 feet, holding 12 tents, each accommodating three men. Thirty-six men are thus completely isolated and are to remain so during their entire 21 days' detention. Between each two of these paddocks is a house 14 feet 8 inches by 14 feet 5 inches, completely divided in the center line. The board partition fence comes to the center of this house. Within, and on each side, are placed a shower, a toilet, a washboard and water tap, and electric light. The floor is of cement. With the present installation twelve 9 feet by 9 feet tents are erected, two to each platform. This leaves an open area of ground 56 feet by 56 feet in which to drill and exercise. Four additional tents could be erected if necessary, giving an added capacity of 12 men—a total of 48. This, however, would not be advisable unless required by necessity. The present total capacity of this camp is 576, capable of expansion to 768. This expansion could not be accomplished if paddocks were occupied and could only be arranged in advance and before men were placed in detention. All tents are erected on wooden floors and side frames used to spread the canvas and fly. Woodwork, tent frames and the fences and houses are painted green,

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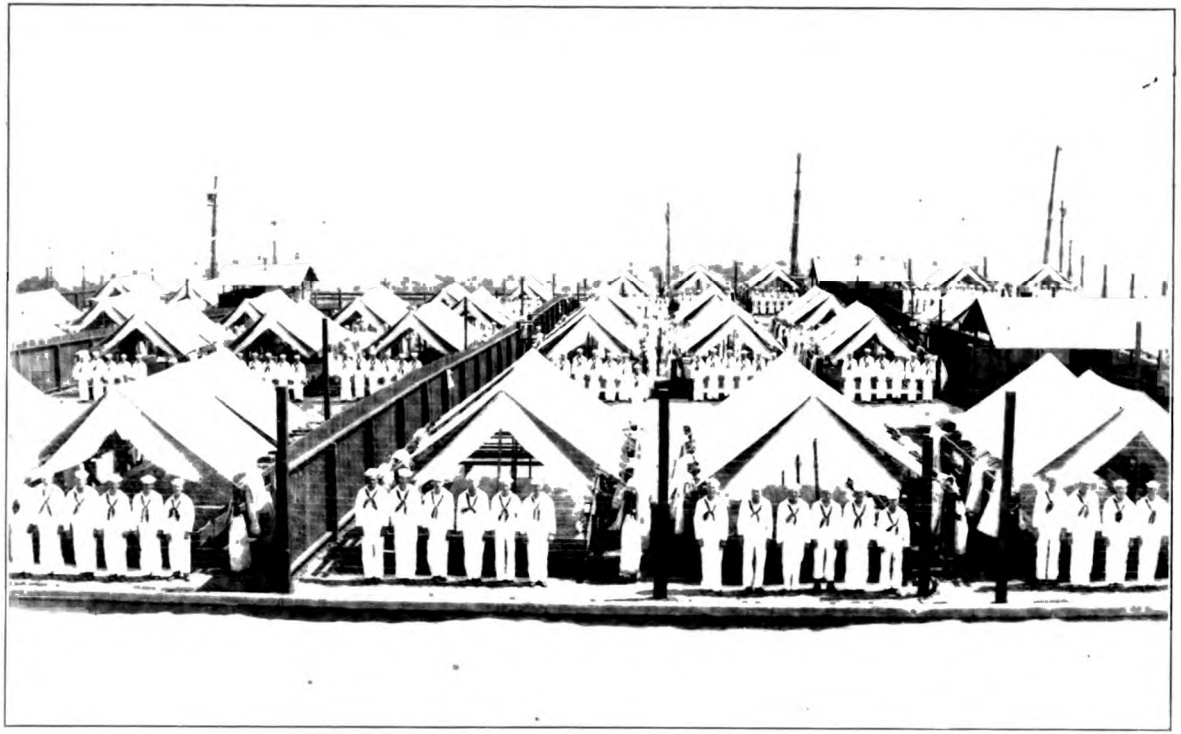

DETENTION CAMP—GENERAL VIEW FROM ROOF OF OPPOSITE BUILDING SHOWING ARRANGEMENT OF PADDOCKS.

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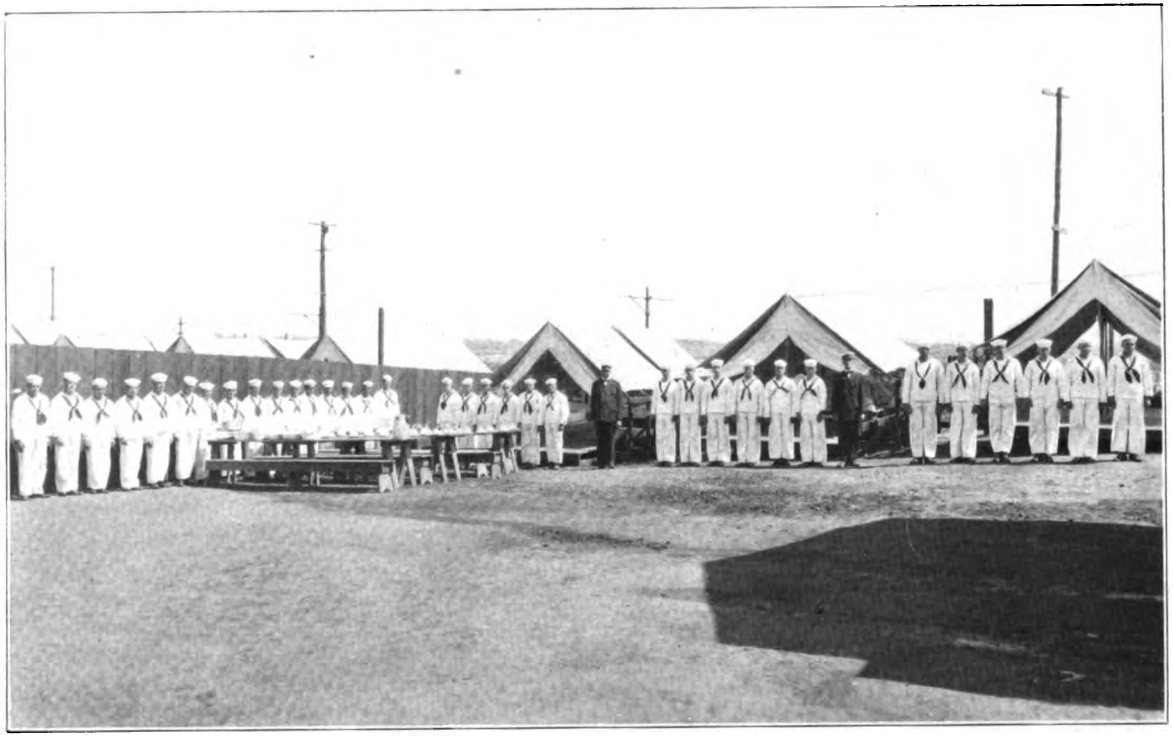

MESSING IN INTERIOR OF PADDOCKS—DETENTION CAMP.

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TRANSVERSE STREET IN DETENTION CAMP.

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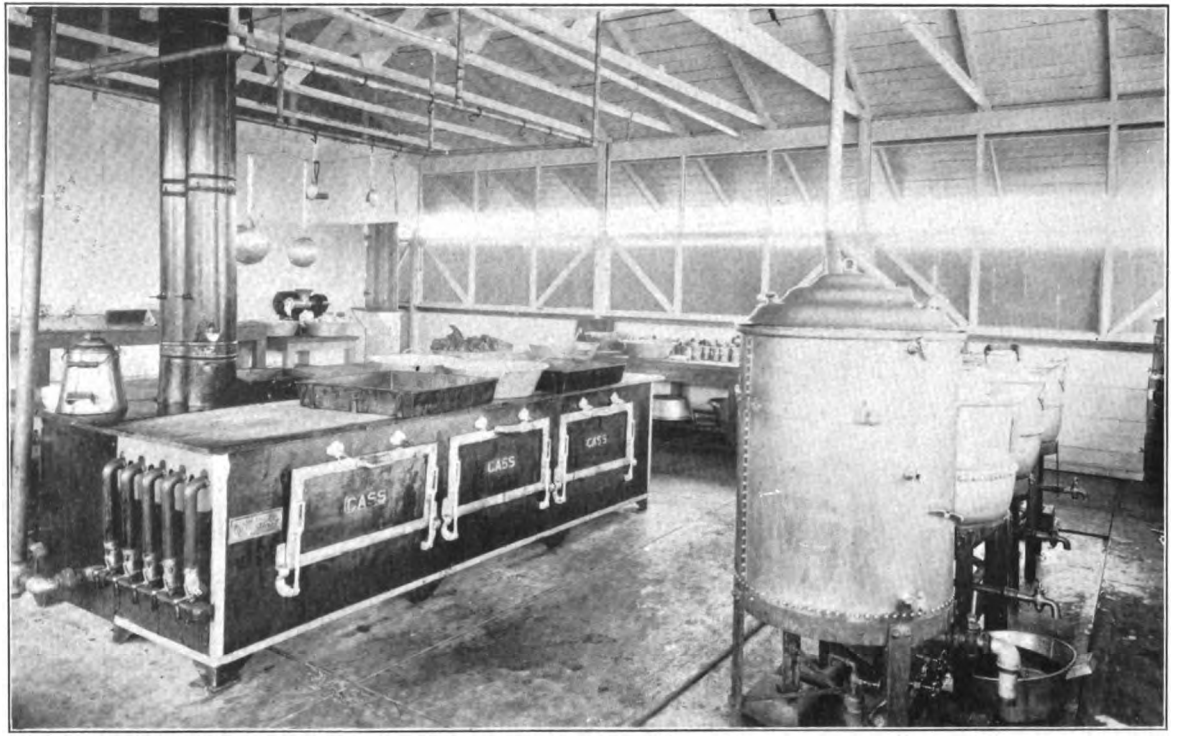

Cook House—Detention Camp.

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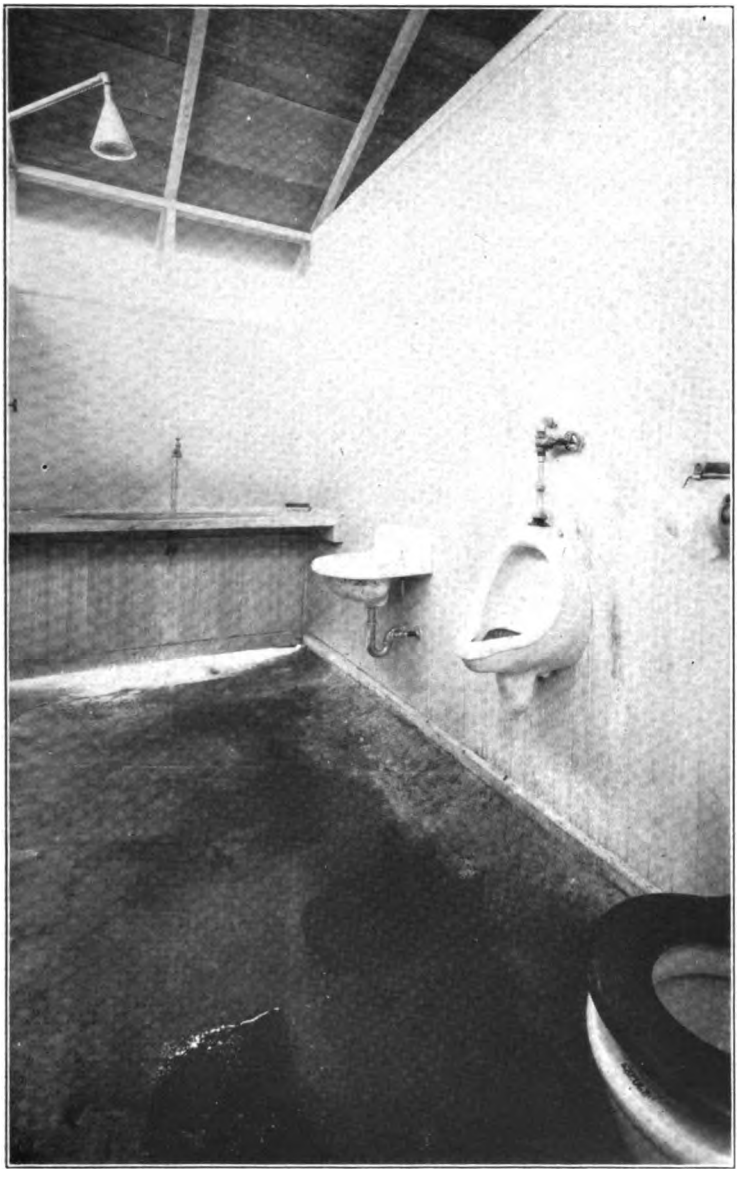

TOILET, SHOWER, ETC., DETENTION CAMP.

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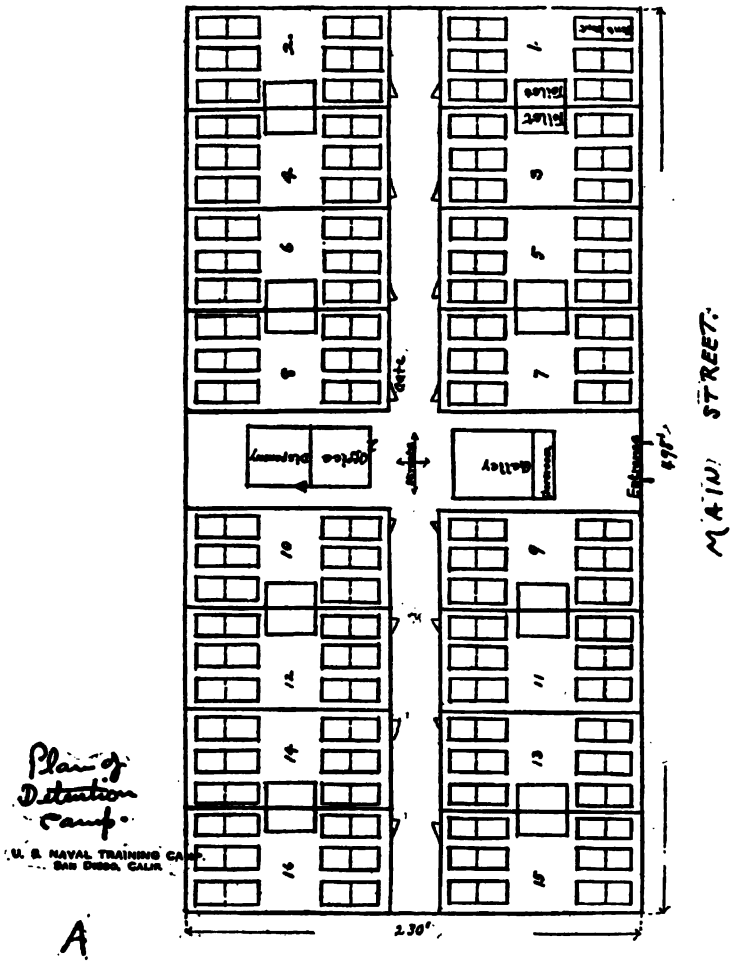

as the bright sunlight here causes considerable discomfort if reflected from light colors. Paddocks are designated by numbers, 1 to 16.

3. The preparation of food for this camp is done in a cook house 40 feet by 30 feet, located in the center of the camp and at the end of the first section of the entrance street, which is 50 feet wide. It is complete in all respects. A storeroom, 10 feet by 30 feet, is made in its western quarter by a partition. The remainder is judiciously employed as a galley space with coppers, coffee urn, tables, etc. It is entirely screened, and sections of these screens raise up, window fashion; below these screens are wide window sills, or shelves, on which the food is placed to be taken by mess men outside for removal to the 16

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paddocks. Ventilation, lighting and water supply are entirely satisfactory. Lighting, water connection and sewer connections are with city system.

4. Across the transverse street, and opposite the cook house, is a house 36 feet by 18 feet, made by placing together two small buildings, formerly used for exposition amusement purposes. The western half of this contains quarters for camp officers, office room, toilet, shower, basin and wash board. The eastern half contains a small and suitable dispensary.

5. The board fences between paddocks are 8 feet high. The inside wire fence is 6 feet high. The wire fence surrounding entire camp is 11 feet high. The camp streets and each tent are electrically lighted. Each paddock is entered by a gate.

6. The men are kept busy with examinations, instructions, police duties, squad, small arms, Swedish exercises, signal drills, etc. Night blinker and other signal drills are conducted by electrical displays on the office building mast, which can be seen by the entire camp. Internal police is performed by each uninfected paddock in daily turns, outside sentry duty by details from main battalion.

7. Attention is asked to the following advantages which it is considered this camp possesses:

(*a*) Complete isolation of units.

(*b*) Ability to expand both within paddocks (36 men to 48); and outside by the addition of entirely new compounds.

(*c*) Maximum of sunlight, drill and recreation space.

(*d*) Completeness of sanitary arrangements.

(*e*) Small cost of installation and maintenance.

(*f*) The camp is entirely self-supporting.

A. Farenholt,
Medical Inspector, U. S. Navy.

IMPROVISATIONS IN HOSPITALS[1]

In a perfectly equipped hospital, if there ever were such, there would be no improvisations, for everything of the best would be at hand to meet any contingency. And just in proportion as such is the case, by so much, is the hospital efficient.

But there are no perfect hospitals and, even in the best of them, improvisation must be resorted to occasionally. Nevertheless we must draw a line between improvisation, a thing of the moment, and substitution, by which is meant the providing of an equally effective but

[1] With six illustrations.

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FIG. 1.—DRESSING CART

Note rocker arrangement of wheels, two at center and one at end. This allows the cart to turn corners easily. An 18-inch rule is fastened to the right leg of the cart, an inventory of load is hung to the left. Cost, exclusive of labor, $4.25.

FIG. 2.—DRESSING CART PASSING THROUGH NARROW DOORWAY

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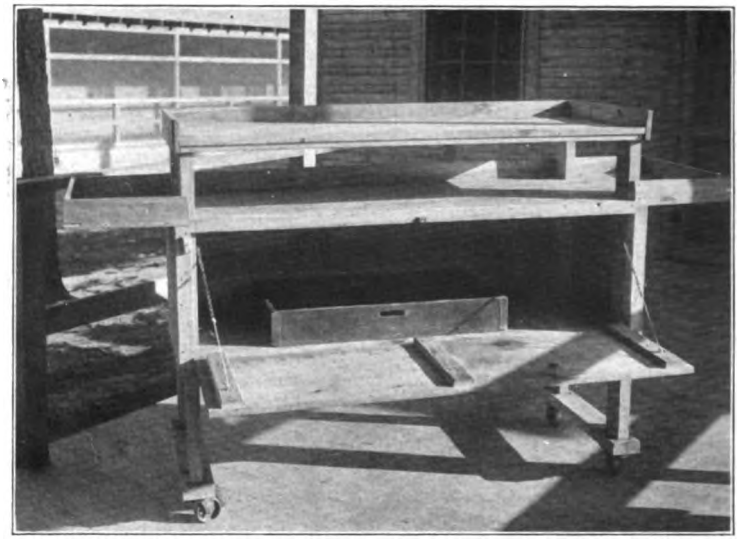

FIG. 3.—FOOD CART—THE LOWER PART USED FOR FOOD, THE UPPER SHELVES FOR DISHES

FIG. 4.—WHEELED STRETCHER

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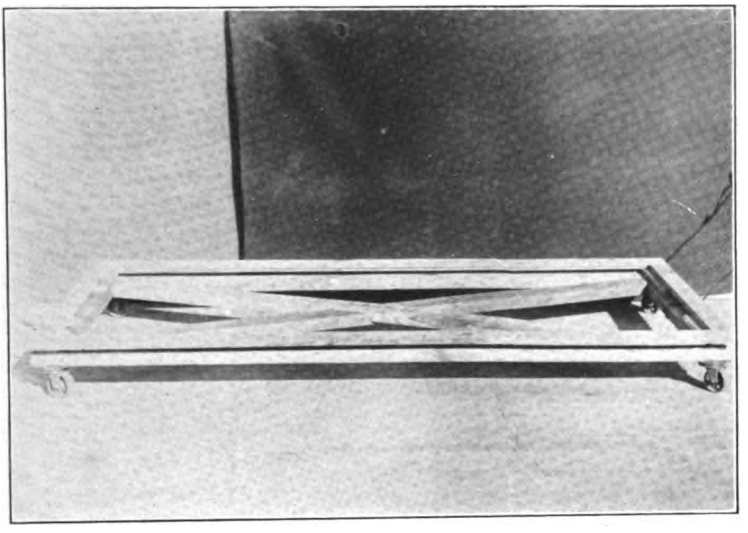

FIG. 5.—BED TRUCK FOLDED

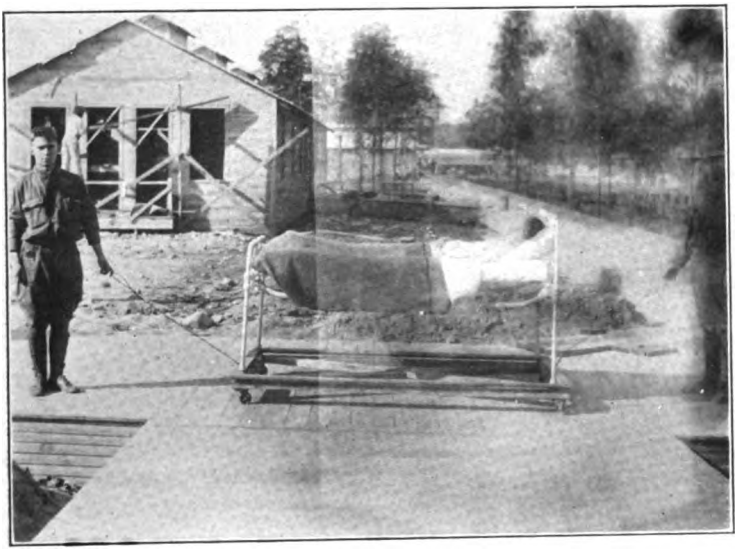

FIG. 6.—BED TRUCK LOADED

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inexpensive substitute, for a more elegant appliance, for permanent use about the hospital.

In military hospitals we should seek to approach as near as may be to the highest standards, but in the field it would be wholly impossible to attain unto the material accomplishments of, say, the Peter Bent Brigham Hospital, though with ingenuity we could devise substitutes which would give equally good results. He who has the most and best tools is not necessarily the best workman, but no man can do really good work unless he has an adequate supply.

It is certain that in our war hospitals we will have to provide substitues for almost everything we have been accustomed to find ready at hand, or could send for to a neighboring store, and the really great medical officer is one who will have the vision to devise and provide these substitutes, against the time when they will be needed.

THE MILITARY SURGEON is fortunate in being able to present two memos in this issue, along somewhat similar lines, which would indicate that our medical officers are quite alive to the situation and will not permit themselves to fail in their work, or even to complain, because of lack of immediate access to a furniture store or instrument shop.—*The Editor.*

Major John C. A. Gerster, M. R. C., U. S. A., writes:

Vehicles for hospital use such as dressing carts, wheeled stretchers, bed trucks and food carts, if made of metal, cost between $75 and $125. Vehicles serving the same purposes can be improvised by constructing them of wood and fitting them with small iron wheels—four to the vehicle. The cost varies between $2.85 and $5.50, depending on the type of vehicle in question.

A dressing cart (Fig. 1), roughly estimated, costs $4.25 for material, exclusive of labor (in an army organization this cost is nil).

A food cart of the type shown in Fig. 3 costs $5.50 for materials, including lumber (110 square feet) and hardware (cast iron casters, 4; 5-inch strap hinges, 2 or 3; rope or chain, 4 to 5 feet; nails, 1 pound; 4-inch bolts, 16). This cart serves a double purpose. In the enclosed bottom section, the food containers are carried from the kitchen to the wards. In the diet kitchens of the latter the food containers are placed on small stoves and the food is then placed in individual dishes on the shelves of the food cart (which now constitutes a "tray cart"), which is then rolled into the ward for delivery of food at the bedside.

A wheeled stretcher (Fig. 4) costs not more than $3.75. It can serve as a wheeled carrier of the regular army litter by having holes countersunk for the four litter stirrups.

A bed truck (Figs. 5 and 6) costs $2.85. It is simply a wooden frame with swivel casters at the corners. It is the only type of vehicle in the list which requires swivel casters; the other types all do well enough if provided with the simple type of cast iron wheel shown in Figs. 1 and 4; these are placed as follows:

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two at the center, blocked up a little, one at each end. This allows for a little "fore and aft" seesawing, and permits an easy turning of corners.

The vehicles were in use and the photographs made while the author was in charge of the surgical service of the base hospital, Camp McClellan, Alabama.

From a transportation point of view it will be seen that it is much simpler to send lumber and hardware to any given point and to have the construction on the spot than to send crated vehicles which would take up many times the space.

THE HART FOOD CART[1]

A hospital train food cart, on the same principle as that described by Major Gerster, but which can hardly be called an improvisation or even a substitute, is described by First Lieut. George B. Rietz, M. R. C., Commanding Hospital Train No. 1, in the following interesting note on its evolution:

The distribution of food to patients in hospital trains is a problem which, heretofore, has given occasion for much thought and concern to those in command of such units.

In the operation of Hospital Train Number One, on the Mexican Border in 1916, it was necessary to serve the food in the kitchen car (Fig. 1) and then carry it on trays to the patients or else carry the food into the car in bulk, in non-insulated vessels, from which it was served by the nurses.

Both methods were open to the objections that the food invariably reached the patients cold; due to the small amount of space available in a kitchen car, in which to serve, there was a cluttering of attendants in this car at meal time and the service could not proceed with that orderliness which is so essential in hospital train work; and due to the swaying and jerking of the train, more or less of the food was spilled over the utensils and to the floor of the car.

In an endeavor to meet and obviate these conditions in a satisfactory manner, a food cart, a description of which follows, was designed by Maj. W. L. Hart, Medical Corps. Two of these have been built by the Pullman Company for use on Hospital Train Number One, and it is confidently expected that they will fulfill all requirements. The cart is a combination of the tea-cart and fireless cooker, adapted to meet the special conditions.

The cart is 34 3/8 inches high, 45¼ inches long, 19 inches wide over all, and is constructed of birch, which has been stained mahogany. At one end of the lower frame-work are attached two 12-inch iron tire, hickory wheels with hickory hubs. The wheels have ball bearings. At the other lower end of the cart the framework rests on the floor. On the upper part of the framework, on the same side where the frame rests directly on the floor, are two projecting handles continuous with the upper framework. The top is covered with white metal and has two openings for the food containers. These containers

[1]With two illustrations.

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THE HART FOOD CART.

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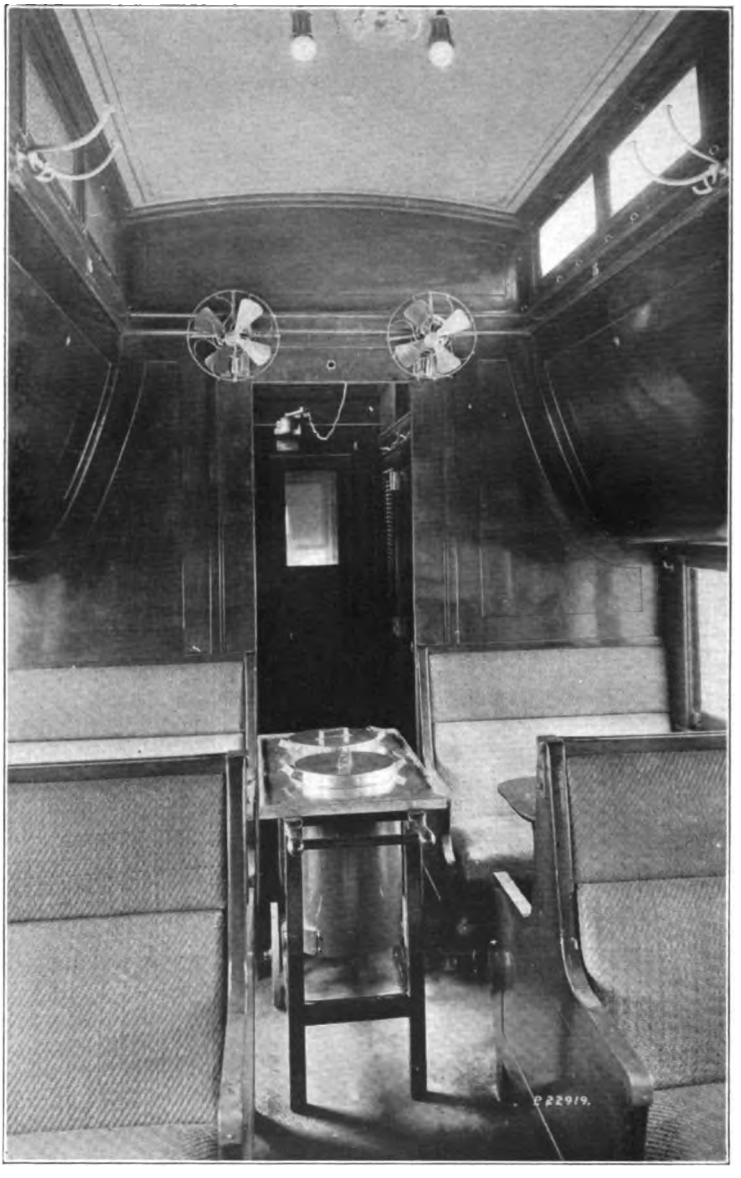

THE HART FOOD CART.

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are made of copper and have a capacity of 5 gallons each. Each container has a removable cover. The receptacles in which these food-containers rest are constructed so as to prevent the loss of heat and also maintain the heat of its food contents. To do this it was necessary to construct these receptacles, which are cylindrical, so that they had two walls, $^1/_{16}$ inch apart, and a false bottom. In this space between the two walls pulverized asbestos has been packed and the bottom covered with sheet asbestos. The false bottom has a door which opens outward and is so constructed that a piece of iron measuring $7^7/_8$ inches by 10 inches and ½ inch thick (which is the heating element) can be placed in the false bottom without any difficulty.

The iron disc would probably not be required for ordinary service of food, as the food would retain its own heat for that length of time, but the disc would be required if the carts were used as fireless cookers, especially at night, in the preparation of cereals, etc., for the next morning's meal. In this case the disc would be heated on the range before insertion.

To facilitate the lifting of the carts over end door threshholds and also while going through the vestibules of the cars, a metal handle was attached to the upper frame-work of the carts, opposite the projecting handles.

The carts, with containers empty, weigh 162 pounds each. When containers are full the added weight makes these carts quite heavy. This is an advantage rather than a disadvantage, for while the train is in motion, swaying or going over crossings, this weight gives stability to the carts, thereby preventing the spilling of food.

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CURRENT LITERATURE

ON SPIROCHETOSES.—That the commingling of the different races of the world on the European continent, which has gone on during the last three years of the war, may not prove to be an unqualified blessing in after years for the nations of Europe, is daily becoming more and more apparent to the student of parasitology. The frequent discovery of new parasites of the order of spirochetes would make it appear inevitable that the present attempt at the introduction of democracy into Europe, with the aid of exotic germ carriers, must necessarily be accompanied by the simultaneous introduction there of a *parasito-cracy* in which the spirochetes will, some day, figure as the predominant disease-producing autocrats. It now seems not improbable that, long after all the possible war indemnities will have been paid off, long after all our cripples will have been restored to a life of usefulness or died, these newly introduced parasites will continue a war tax on human lives.

Thus, different varieties of spirochetes alone have been introduced into Europe through Russian troops from the Orient; through English troops from India and Egypt; through French troops from Indo-China and Tonkin; from Morocco and the Senegal; through Turkish troops from Arabia, Mesopotamia and Syria; through English troops from Australia, the South Sea Islands and Canada. Even new species of malaria-bearing mosquitos and the yellow fever germ-bearing stegomyia are threatening southern France, according to Blanchard.

An unusually rich collection of reports on different forms of spirochetoses having recently been published in *Annali di Medicina Navale e Coloniale* (Anno xxiii, Vol. i, Fasc. iii-iv, March-April, 1917), a few abstracts may prove interesting to our readers:

On Ictero-Hemorrhagic Spirochetoses, by Costa and Troisier. Comptes rendus des Séances de la Société de Biologie, December, 1916.

This contribution emphasizes three points: (1) The virulence of the cerebro-spinal fluid in ictero-hemorrhagic spirochetosis, during the initial stages of the disease, in both new cases and relapses; (2) the frequent occurrence of positive reactions of syphilis; (3) the passage of the ictero-hemorrhagic virus from the general circulation into the ammotic fluids of the guinea-pig.

Clinical Study and Laboratory Notes on Ictero-Hemorrhagic Spirochetoses, by Wilmaers and Renaux. Archives medicales belges, February-March, 1917.

In this excellent monograph the clinical signs are described as follows: Onset sudden with general depression and headache lasting often during the first week of the disease; icterus, of varying intensity, coming on on the second to the fourth day; early albuminuria and bilinuria; the temperature quickly reaches 39–40° C., lasting three or four days with slight morning remissions, gradually going down to normal on the seventh to the ninth day; after a few days, fresh rises in temperature occur, sometimes, but less intense and regular, followed by anemia and a prolonged convalescence. These symptoms may be followed by complications; such as hemorrhages, epistaxes, depressions of nervous origin,

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agitations, delirium, nephritis, congestion of the conjunctiva, herpes labialis, constipation, enlargements of liver and spleen. Alongside of such cases, light ones occur in which the prominent symptoms are in abeyance and in which the presence of spirochetes in blood and urine are the only means of identifying the disease.

Treatment.—Neither arsenobenzol nor quinine were found effectual. In the absence of a specific serum, the authors had recourse to treatment with the salicylates of soda and to the administration of adrenaline in cases of arterial depression.

Laboratory Notes.—Under this heading the authors give a detailed description of the microscopic appearances of the parasite which we regret being obliged to omit. Cultures of the germs have so far proved unsatisfactory; the parasites, however, could be kept alive for from four to five weeks by means of the method of Noguchi, with fragments of the kidney from a guinea-pig in pleuritic fluid, in human and guinea-pig blood serum. The disease was also reproduced in guinea-pigs through peritoneal injections of blood, taken from a patient during the fourth to fifth day of the disease. The extreme regularity with which the parasites appear in the urine is considered one of the most characteristic signs of the disease.

Phenomena of Immunity.—It is now admitted that, during the course of the disease in man, there appears in the blood serum, toward the fourth day, an antibody; this time coincides precisely with the appearance of the spirochetes in the urine. This antibody has been put in evidence in two ways: (1) When a guinea-pig, after having been inoculated with infectious liver pulp, receives an injection of serum from a convalescent, either the disease is arrested or, in case icterus had already made its appearance, a cure is effected. (2) If, after the injection into the peritoneal cavity of two guinea-pigs of 2 cc. of hepatic pulp, rich in spirochetes, one of these two receives an injection of convalescent serum, while the other receives normal serum, it is found that the spirochetes have disappeared from the peritoneal fluid of the former within half an hour, while in the latter the spirochetes are still abundant and mobile at the end of two hours. The hepatic antigen, moreover, reacts positively with syphilitic subjects.

The authors sum up their observations in the following conclusions: "(1) The ictero-hemorrhagic spirochetoses observed in Belgian troops seem identical with the affection described by Japanese observers as occurring among the miners in some localities. (2) The causal agent, the spirocheta of Inado-Ido, is very pathogenic for guinea-pigs. (3) The sudden onset, the icterus, the hemorrhages, the febrile curve and the anemia are the cardinal clinical symptoms of the disease. (4) The renal and the hepatic lesions, being the most constant, find their corresponding expression in the albuminuria and bilinuria. (5) The appearance of spirochetes in the blood during the first six days of the disease demonstrated, by the inoculation of guinea-pigs, their presence in the urine from the fifteenth day, confirms the diagnosis. (6) The epidemiology is as yet unknown. (7) The mortality rate is low. (8) Light cases, in which one or more of the cardinal symptoms are wanting, must be diagnosed by a systematic examination of the urine."

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Nosographic, Epidemiologic and Anatomic Notes on Infections, Spirochetic Icterus, by Monti.

After giving an accurate and detailed description of the clinical characteristics of the disease, the author gives us an account of some of his microscopic examination: "In the blood of guinea-pigs, in films from liver substance and spleen, from lymphatic glands, a particular spirochete may be demonstrated by means of Giemsa's method. The histological examination of the liver shows disseminated necrotic foci, punctiform hemorrhages; around such areas the spirochetes are abundant; others are found collected within the lumina of intralobular capillaries and the larger blood-vessels and even in the biliary ducts. Monti believes in the identity of hemorrhagic icterus, as found in troops, with that described by the Japanese; he believes it possible that the disease may be transmitted through the urine especially under the conditions of overcrowding prevailing in the trenches, and in spite of the fact that the parasites in question do not survive twenty-four hours in the cadaver.

Ictero-Albuminuric Spirochetoses and Recurrent Fevers, by Gabbi. *Riforma Medica,* 17 March, 1917.

"The symptom-complex observed in our soldiers at the front, when compared with that given by Japanese physicians and that of Weil, some thirty years ago, differs from them in that the symptoms are less complicated, the relapses rarer, the mortality lower, and in that it is sporadic rather than epidemic. The morphology of the spirochete described by the Japanese corresponds entirely with that given by the Germans and by some of our own authors. As for the sindromes and the morphology of the spirochete there is no such thing as identity between the forms observed in Japan and those met with among our troops. Instead of speaking of more than one indigenous form, we must assume imported forms." According to Monti, spirochetic infectious icterus has been *imported from the Orient,* passing from the Russians to the Germans and Austrians and, from them, to the French and Italian fronts. Since hemorrhages, in the cases observed in France and England, are often wanting, Monti proposes to call the disease "spirochetosis ictero-albuminurica."

Spirochetosis Ittero-emorragica, by Cesa Bianchi. Societa lombarda di scienze mediche e biologiche, February, 1917.

The spirochetic virus, contrary to the assertions of the Germans and the Japanese, does not pass through Chamberland's filters; it is attenuated by a temperature of 45°, rendered inactive by 55°; possesses but slight resistance to cold, to sunlight, to putrefaction, to osmotic pressure, to the air. On this account the author finds it difficult to believe in the transmission of the disease through water, contaminated food or direct contact; he deems it more probable that the disease is disseminated by one of the blood-sucking insects.

The Meningitis in Ictero-hemorrhagic Spirochetosis, by Costa and Troisier. *Presse Medicale,* n. 19, April, 1917.

Virulence of the Central Nervous System in Experimental Infection.—"The spirochete of hemorrhagic icterus has an affinity for the nervous system not less

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strong than that of syphilis. The inoculation of experimentally infected cerebral substances has shown itself to be as virulent as the inoculation of blood, urine or hepatic parenchyma; often, even, it occurs that death supervenes more rapidly in animals inoculated with cerebral substance." In our authors' experience, meningitis is a common complication of ictero-hemorrhagic spirochetosis. The headache is localized in the frontal and occipital region. The rachialgia is accompanied by general muscular contractions of the trunk, rendering the patient as rigid "as a stick of wood." One of the first symptoms to make its appearance is rigidity of the nape of the neck; the symptom of Kernig is constantly present, whether the patient is sitting up or lying down.

Intellectual disturbances, though rare, are agitations and low delirium, the tendon reflexes are diminished or abolished; pupils sluggish: cutaneous reflexes exaggerated. Vomiting is constant at the onset; pulse is rapid and goes up with the temperature.

In the meningeal form of the disease, there is an intense leucocytosis; polinuclears predominate to the extent of 70 to 90 per cent; in the ordinary forms the polinuclears, mononuclears and lymphocytes are equal in numbers; whenever there occurs a lymphocytosis at the beginning, the prognosis is favorable. The chemical alterations consist in hyperalbuminosis; the chlorides are slightly increased in amount; sugar may be present; urea may supersede 4 grams.

The diagnosis is confirmed by the inoculation of infected urine into a guinea-pig, in which a characteristic disease is thus produced. Besides, the serum from a patient with spirochetosis fixes complement in the presence of syphilitic antigen, in the same manner that serum from a syphilitic patient fixes conplement in the presence of spirochetic antigen. Neutralization reactions of the virus may also be employed with advantage.

The course of the meningitis is always favorable and the issue depends rather upon the general state of the patient than on the meningeal complication. Arsenical preparations should never be given, in view of the serious nature of the existing renal and hepatic complications. Good results were noted with the antispirochetic serum of Martin and Petit, injected intraspinally.

Rats and Spirochetosis, by Courmont and Durand. *Bulletin medical,* n. 5, 1917.

Examining fifty sewer-rats, from the sewers of Lyons, the authors were able to provoke hemorrhagic icterus in 8 per dent of their cases; thence they conclude that the spirochetes are widespread and not confined to any particular locality.

Spirochetosis and Marmots, by Sawal. *Presse medical,* p. 1017.

In the blood of two marmots that had been inoculated with the blood from a patient on the third day of the disease, and which died during the period of pyrexia, specific spirochetes were found.

Ictero-Hemorrhagic Spirochetosis in France, by Martin and Petit. *La Presse medical et Journal des Praticiens,* December, 1916.

The authors believe that the treatment to be relied on is serotherapy; they had obtained a curative serum from the horse which is inoffensive for the normal

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guinea-pig. This serum, in small doses (1 to 2 cc.). neutralizes completely, *in vitro* as *in vivo*. a quantity of the virus, able to kill the control animals in a few days; one single injection, given on the third day of the disease, will prevent icterus and the death of the animal which had been given a dose of poison, usually killing it in six days.

Serotherapy in Weil's Disease, by Inada and Ido. *The Journal of Tropical Medicine and Hygiene,* January, 1917.

The authors employed an immune serum which they had obtained from horses. Out of thirty five patients that were treated with this serum, seven died. The usual mortality from Weil's disease in Japan, ranges from 30 to 48 per cent. In view of this reduced percentage mortality, the authors maintain that serotherapy has a considerable effect on the disease.

Immunizing Substances in Convalescents from Icterogenic Spirochetosis, by Carnier and Reilly. C. R. Soc.: Biologie, 1917.

Blood serum, obtained from convalescents after severe attacks, is richer in immune substances than serum from patients having passed through light attacks. Experimenting with guinea-pigs, these authors were able to demonstrate the highly protective value of the former against the disease virus, while the protective value of the latter was slight or altogether absent.

On the Etiology of Weil's Disease, by Weil. *Deut. med. Wochenschrift,* 1916.

The author observes that many writers, recently, have described, under the denomination of "Weil's Disease," a disease entirely different from that which bears his name, namely: an acute infectious disease with enlarged spleen, icterus, nephritis. According to the author, the spirochete of Huebener and Reiter has nothing in common with the disease described by him.

The preceding abstracts were made from an interesting collection appearing in the *Annali di Medicina Navale e Coloniale* of March-April, 1917, with apologies due to A. R. Gori. H. G. Beyer.

"Du Groupement en Colonies Agricoles des Soldats Paludéens, Momentanément Inaptes," by Dr. Jeanselme, Medecin-major de 1re classe. *Bullstin de l'Academie de Medicine,* Tome lxxviii, Seance 10, Juillit, 1917, p. 21.

Jeanselme expresses the opinion that a malarial infection, after passing the primary stage, is one of the most tenacious of infections, stating that, no matter what the medication, whether large doses of quinine or arsenic, whether introduced by the mouth or otherwise, the infection is merely rendered latent, rarely cured.

Malarial subjects, having apparently recovered after an energetic course of treatment, improved in color and in weight, will suffer from a relapse but a short time after the treatment is stopped. Every slight fatigue incurred will have the same result and thus prove the fictitious and precarious character of such a cure. One of the best tests to prove that the cure is merely apparent is to give one of these patients an intravenous injection of 250 cc. of normal physiological salt-solution; it will be followed by a classical malarial attack.

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Instead of giving such patients leaves of absence, Jeanselme proposes to send them in groups on farms where their treatment is to be continued under proper supervision, and where they may do useful work under the best hygienic conditions, until a more enduring cure is effected!

H. G. Beyer.

War Cripple Axioms and Fundamentals.[1]

Each of the thirty-three paragraphs under the above heading, which we quote *in extenso* from Dr. McMurtrie, presents an axiom. They all should be engraved in golden letters on the hearts and minds of every one who undertakes to devote his time to, or indeed every one who will be in any way connected with, the present or future re-education of our war cripples; they should become the principles of action and permanent guides to experts, professionals and lay-assistants alike, for they are the results of actual experience, coupled with profound thought, fertile imagination and sound reasoning; the outcome of a single-minded life among cripples, of a man in the truest sense of the term, and of an observer and worker of no ordinary ability, circumspection and judgment. The lessons conveyed by a study of these paragraphs should be accepted as the foundation for the development and elaboration of any future plans of reconstruction, deserving to be considered sound and entitled to the claim of being well conceived.

H. G. Beyer.

Douglas C. McMurtrie, who has given years of study and observation to the subject, sums up the position and prospects of the disabled soldier and sailor from various viewpoints. Certain statements made by him are here quoted chiefly because *they are accepted as true by the majority of practical rehabilitation students.*

1. *The waste involved in the complete support in all countries of thousands of workmen injured* in more or less serious degree, became soon apparent, and the authorities cast about for some means to decrease the percentage of disability. The solution was found—notably in Belgium and France—in trade-schools for the re-education of the crippled victims of industrial accidents.

2. The first country to act in preparation for cripples of the present war was Germany, the national association in the interest of the deformed issuing a call to its members eight days after the outbreak of hostilities. The next move was in France, when Edouard Herriot, mayor of Lyons, undertook the organization in that city of a municipal training school for the *mutiles de la guerre.* In England the Incorporated Soldiers and Sailors Help Society—organized after the South African war to maintain workshops for disabled veterans—largely extended its activity. In Canada a federal commission began at once the establishment of convalescent homes and training classes. Italy and Russia likewise took thought for their cripples during the early months of the war.

3. The wounded soldier comes through the field and base hospital and, finally, if his disability is such as to disqualify him from further military service, he is returned from overseas to a convalescent hospital at home. Certainly, *at this point, if not perhaps earlier, preparation for his social and eco omic rehabilitation should begin.*

[1] From Bulletin No. 1. Surgeon General's Office, U. S. Army. Division of Reconstruction and Re-education. January 19, 1918.

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4. *The new handicap usually throws the man into a state of extreme discouragement.* The loss of a hand, an arm, or a leg seems, to the man formerly able-bodied, an insuperable obstacle to his future economic activity. The prospective pension is the only mitigating feature of this depressing outlook, and he begins to calculate how he can exist on the meager stipend which will become his due. He has basis for this expectation, for has he not known in the past several men each of whom had lost a limb through accident? It was necessary for them to eke out a living by selling pencils on the street. Again, life will hold no pleasure in the future· he will always feel sensitive about his missing limb. Besides, nobody has any use for a cripple.

5. Such a state of mind will be encountered in the convalescent soldier. *It must be met and overcome.* With returning health, initiative must be reawakened, responsibilities quickened, a heartened ambition must replace discouragement. We can go to him and truthfully say: "If you will yourself help to the best of your ability, we will so train you that your handicap will not prove a serious disadvantage; we will prepare you for a job at which you can earn as much as in your previous position. Meantime, your family will be supported and maintained. You will be provided with a modern artificial limb so that a stranger would not know you are crippled. Finally, we will place you in a desirable job."

6. The first reaction to this program is *fear that an increase of earning power will entail a reduction of pension.* When re-education of war-cripples was first begun in both France and Germany, it was found that many of the men were unwilling to undertake training, in apprehension of prejudicing their pension award. The solution of the difficulty was official announcement that such would not be the case, but that pensions would be based on degree of physical disability alone, without reference to earning power. In Canada, a placard to this effect is posted in all military hospitals and convalescent homes.

7. The choice of trades, in which war-cripples may wisely be trained, is of primary importance. In addition to considering whether men with certain types of physical disability can engage in a given trade its present and prospective employment possibilities must be taken into account. If it is a seasonable trade, if the number of workers needed in any locality is so small as to make difficult the absorption of many newly trained men, or if the industry is on the wane rather than enjoying a healthy growth, the indications are negative. The ideal trade is one in which the wage standards are high, the employment steady, and the demand for labor constantly increasing. In picking trades, the present boom conditions should be discounted.

8. The trades actually being taught to war cripples are many and varied. In France at the notable Ecole Joffre at Lyons there is instruction in accounting and commercial subjects, toymaking, bookbinding, shoemaking, woodwork, mechanical, drafting, tailoring, woodcarving, gardening, and machine tool work. At the suburban branch at Tourville, agricultural courses are given. In Paris at the "Institute National Professionel des Invalides de la Guerre" are taught the standard trades of tailor, shoemaker, harnessmaker, and tinsmith. Also, dependent upon the ability of the individual pupil, instruction is provided in accounting, industrial design, cabinet-making, and automobile engineering—particularly the operation and repair of agricultural tractors.

In Rome, the Italian war cripples are being taught commercial subjects, carpentry and wood-carving, bookbinding, boxmaking, saddlery, and leatherwork, shoemaking, tailoring and blacksmithing. At Naples there is instruction in shoemaking, tailoring, telegraphy and commercial subjects.

The school in connection with the Maximilian Hospital at Petrograd offers a

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considerable range of courses, among them the following: manufacture of orthopedic apparatus, locksmithing, shoemaking, cabinet-making and tailoring.

At Nurnberg, Germany, the crippled soldier learns to become a blacksmith, locksmith, maker of orthopedic apparatus, machinist, cobbler, tailor, cabinet-maker, saddler, upholsterer, weaver, paint-brush maker (a strong local industry), printer or bookbinder. There is also instruction in industrial design as applied in varied fields. At the Dusseldorf school, instruction is given in machine-tool work, mechanical drafting, building trades, telegraphy, and commercial and civil service subjects.

In England, the workshops of the Incorporated Soldiers and Sailors Help Society provide training in the following trades: carpentry and cabinet-making, printing, polishing, carving and gilding, picture framing, toymaking, basket-making, metal work, building and construction, decorating and electrical fitting. The principal subjects at Roehampton and Brighton (Queen Mary's Convalescent Auxiliary Hospitals) are inside electrical wiring, motor driving and repairs, and woodworking, which includes bench and lathe practice. At Cliveden and at other points in Britain, agricultural training is available.

In the Canadian schools, under the auspices of the Military Hospitals Commission, the leading trades are motor mechanics, machine tool work, carpentry and wood turning, inside electrical wiring, telegraphy, cobbling, operation of agricultural tractors, general farming and poultry raising. Instruction is also provided in bookkeeping, general office-work, and civil service subjects.

9. The section of the country in which a man lives also has a bearing on the choice of a trade in which he is to receive instruction. Thus a Canadian, living in Montreal, may be trained as a machinist; the same man, if a resident of a far western province, would better be given instruction in the operation of motor tractors for agricultural work.

It is axiomatic that a man should be given his course of training in a locality near home. Here he will not feel so strange, friends will not be far away, and the educational authorities will be in closer touch with the local industrial requirements and employment conditions.

10. It is the general consensus of experience that the decision by the man to undertake a course of training must be a voluntary one. Of course, he might be retained in the military organization and detailed to trade classes in the same way as he is detailed to guard duty, but this would not make for successful results. The unwilling and rebellious pupil learns but little, the earnest and ambitious one makes rapid progress. The man must be persuaded, therefore, to take up instruction; the future advantages of being a trained workman in some skilled trade should be pointed out, and the practical arrangements to be made for him during the course of instruction carefully explained. There is no royal road to success in this effort, but after gaining the soldier's friendship and confidence, a patient persistence will win the battle. If a competent visitor has been in touch with the man's family during his absence at the front, the members of the home circle can be easily convinced of the wisdom of his re-education; this will make all the simpler persuasion of the man himself.

11. A difficulty is found in the abnormal premium on industrial labor in war time. Even a disabled man may be able to go out and earn seven dollars a day in a munition factory. This constitutes a very potent present counter-attraction to representations of moderate but permanent employment, after a course of training. If he makes the opportunist choice he will, upon the return of employment conditions to normal, be reduced to the status of a casual laborer, perilously near the verge of mendicancy. No pains should be spared to prevent this eventuality.

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12. In deciding which of the available courses an individual disabled soldier should pursue, the first effort should be to fit him for an occupation related as closely as possible to his former job. His past experience—far from being discarded—should be built upon. A competent journeyman bricklayer who has lost an arm may be prepared, by a suitable course in architectural drafting and the interpretation of plans, to take a position as construction foreman of a bricklaying gang. It were idle to give such a man a course in telegraphy. But a train hand who has been all his life familiar with railroad work may most wisely be trained as a telegraphic operator, with a little commercial instruction on the side.

13. This rule applies, however, only to men who were, previous to their enlistment, operatives in the skilled trades. Their problems are the simplest of solution. But in the present war, when not only professional soldiers but whole nations are in arms, there will return disabled many young men who had not yet attained a permanent industrial status. Some will have entered the army direct from high school or college; others will have been migratory workers who had not yet found a permanent niche and whose experience has been too varied to be of much value; still others will have been drawn from unskilled and ill-paid occupations which hold little future opportunity for the able-bodied worker, and almost none for the physically handicapped.

14. Advice in each case should be given by an expert vocational counsellor, a man familiar at once with trade education, with the requirements of the various industries themselves, and with the current status of the labor market. His opinion should take into account the report and prognosis of the medical officer, and also the past record of the individual. As has been pointed out, the friendship and confidence of the soldier are absolutely essential. Very often they are difficult of attainment and the prospective pupil's reserve is penetrated only in the fourth or fifth visit. As the decision to undertake training at all must be voluntary, so must the choice of particular trade meet with the full approval of the soldier himself. And if, after beginning the course, the subject proves definitely distasteful, the opportunity to change to another trade should—within reasonable limitation—be permitted. It cannot be too strongly emphasized that the unwilling pupil is a poor learner, indeed.

15. It would seem inadvisable to train a man for an occupation which he can pursue only by use of specialized apparatus, adapted to the individual motor limitations imposed by his deformity. While a badly crippled man may be taught to operate a lathe with special treadles, or to run a typewriter with special paper feed and shifting mechanism, his employment opportunities will be precarious. It may be possible to secure for him one specific job which may be arranged for at the time he starts training. But if he cannot get along personally with his employer, if his family must move to another city, if his wages are not advanced as his product increases—for these and a myriad other reasons, he may become practically unable to obtain other employment, and the value of his training will be thus nullified. Ingenuity should be directed rather to fitting crippled men to meet the demands of standard trades, in which there will be not one or a dozen possible jobs, but thousands. Only thus can the man be made actually independent.

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ABSTRACTS FROM THE LITERATURE OF PLASTIC AND ORAL SURGERY[1]

OFFICE OF THE SURGEON GENERAL, UNITED STATES ARMY

Section of Surgery of the Head

FRACTURES

1. COLE, P. P., and BUBB, C. H. Deformities of the Jaws Resulting from Operation or Injury. *Brit. Med. Jour.*, 1916, i, 268-271.

Deformities Resulting from Injuries.—The slightest inaccuracy in reëstablishing the correct relation of fragments in the lower jaw results in serious interference with function.

Wiring of the bone is condemned emphatically.

Every fracture of the mandible should be treated in terms of the upper jaw.

(*a*) *Fractures without Loss of Substance.*—No treatment is adequate which permits a margin for error. Where teeth are present on both sides, a cast interdental splint of aluminum is employed. Also a cast aluminum splint of the Gunning type.

(*b*) *Fractures with Loss of Substance.*—Usually compound both inside and outside the mouth. It is absolutely essential that these cases be treated from the beginning. The main fragments must be retained in correct relation with the upper jaw. All consideration as to union must be abandoned in favor of maintenance of correct alignment. The teeth are to be preserved wherever possible. Prevent deformity by early fixation in correct position. If deformity has occurred, rectify by surgical intervention followed by fixation. This is superior to apparatus for slow correction. Methods of fixation depend upon size and position of gap, and number and disposition of teeth remaining.

Necessary surgical measures will consist in plastic operations for reconstructing the damaged soft parts and introduction of bone grafts. In many cases, however, where teeth are present and properly placed, a lower denture can exercise the functions of an efficient splint.

Fractures in the region of the condyle should be treated in "open bite" position, thus obviating the crippling results of cicatricial contraction or callus formation.

2. COLYER, J. F. Treatment of Gunshot Injuries of the Jaws. *Jour. R. A. M. C.*, 1916, p. 597.

The writer states that the too early adaptation of a splint, by adding to the sepsis, may just alter the balance between life and death. The first aim is directed to saving the life of the patient. The next step is directed toward insuring the union of the jaw; if this can be carried out by restoring the contour of the jaw and the occlusion of the teeth, all the better, but if, by endeavoring to restore the contour of the jaw and occlusion, risk is run of obtaining non-union, then the ideal should give way to the practical, for it is far better for an individual to have a firm mandible and a moderate amount of malocclusion than an ideal shaped bone which is unable to bear the stress of mastication. The masticating surface in a mandible, with malunion, can often be easily rendered efficient by artificial dentures.

General Routine of Treatment.—On admission, brief notes are taken and mouths cleansed either by mouth washes or frequent syringing with hydrogen peroxide, and once a day the gums are swabbed with 2 per cent iodine in alcohol. Skiagrams are obtained and models of mouth made. The next step is to anesthetize the patient and examine character of injury and see how far reduction of fracture is possible. Any sinuses present are also examined and treated, but no attempt is made to remove necrosed bone unless sequestrated. The necessary splints are made and adjusted if needful under an anesthetic.

Graduated Course of Diet in After-treatment.—(*a*) Fluids; (*b*) minced; (*c*) boiled; (*d*) ordinary. (*a*) Milk, beef tea, chicken broth, supplemented by extras. (*b*)

[1]Being a complete review of the war literature compiled in the office of the Surgeon General, United States Army, up to Jan. 1, 1918.

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Minced chicken, minced ordinary diet, supplemented by minced fish, eggs and semi-fluid puddings. (*c*) Boiled ordinary diet, supplemented by fish, eggs, suet puddings, and toast. (*d*) Ordinary regulation diet.

Splints.—Hammond's interdental wire splint for cases with good teeth and no displacement. Rarely applicable.

Metal cap splint is by far the most useful.

Gunning metal or vulcanite splint used with the teeth in occlusion.

Wiring teeth.

Skull and Mandibular Splint.—Skull cap woven out of thick mercerised cotton and bordered by a rim of braid ¾ inch wide. Two hooks fitted on each side in front and one behind. Connected to metal mandibular splint which passes under the chin by means of tapes and, according to pressure exerted, one may obtain an upward or a backward pull. Used as an adjunct to interdental splints.

In fractures in region of molars, the posterior fragment is usually drawn up and in and meets the teeth of the opposing jaw. Anterior fragment slews round to injured side. If upward resistance to posterior fragment is removed by extraction of posterior teeth, the fragment will move still more upwards, but at the same time forward, and so bridge over the gap of lost tissue.

An important cause of non-union is the presence of septic teeth. Stress laid on the uselessness of plating septic comminuted fractures.

Closure of the jaws following fractures, and other injuries.—The use of a wooden screw gag is not satisfactory, as it may force the mouth open in an oblique direction. Equal distribution of force by means of apparatus is suggested. The mouth is screwed open at night and the gag remains in until morning. Apparatus consists of two curved plates covering the occlusal surfaces of the teeth, the teeth being united at each end by parallel screws supplied with nuts.

Treatment of Cicatrices.—Plastic operations can be rendered much easier, or even dispensed with, by preliminary treatment. When possible, models of the mouth are obtained and a vulcanite splint is constructed to bulge out the tissues in the region of cicatrices. The splint is made so as to fairly occlude with the upper teeth. The cicatrix and adjacent soft tissues are freely divided from the bone with a pair of scissors, the separation being made close to the bone. While the patient is under the anesthetic, the splint is placed in position and modelling composition firmly pressed in between the separated parts, and reconstruction of the splint completed. The wound in the mouth is then packed with gauze and the vulcanite splint placed in position within forty-eight hours. Additions may be made to the splint from time to time. Stretching of the tissues is assisted by regular massage.

In some cases with limited opening of the mouth, the splint may be attached to the external chin splint by wire passing from the mouth.

3. Frey, L. Views upon the Prosthetic Restoration of Fractures of the Maxillaries and Mutilation of the Face.

The fractures of the maxillaries, which we observe during the present war, are divided into two classes according to whether or not there is more or less destruction of the osseous tissue. Therefore we have fractures without any loss of substance and fractures with loss of substance. The former are the less frequent and in this special article they do not present any particular interest. They have for a long time been known and studied regarding their symptomatology, anatomy, pathologic physiology and treatment. These fractures of the the first class only deserve short mention, and their treatment is not unlike that described in all treatises on surgery.

Fractures with a loss of substance are those which we shall study here. The first class are known as fractures of times of peace; the second are more exclusively called the fractures of war. They are characterized by a more or less extensive loss of the bony tissue. The greatest mutilation of the tissue always corresponds to the orifice made by the exit of the missile. A splinter of shell is usually most destructive

The Different Stages of a Prosthetic Restoration.—Since there is a loss of tissue it is easily conceived that there must be different stages of procedure comprised in the restoration by the stomatologist. My personal experience allows me to establish four different stages:

First Stage.—The one or more remaining fragments of the maxillaries always

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show a tendency to deviate toward the least resistance. The masticating surfaces of the teeth lose contact with the surfaces of occlusion presented by the opposite teeth. In other words, the normal articulation disappears. The first stage is to reëstablish what remains of the masticating surfaces by bringing the fragments into a position which will allow the normal occlusion.

Second Stage.—The mere restoraton of the occlusion is not sufficient. Deviation shows a constant tendency to recur. The occlusion must be maintained.

Third Stage.—The mutilation has very deeply disturbed the dynamic equilibrium of mastication. The fragments remain—thanks to the support—in the proper position, but the masticating muscles do not act with equal force on the mutilated tissue. If there remains but one-half or two-thirds of the inferior maxillary, the molars alone meeting the upper teeth, the cuspids and incisors remain far distant from their antagonists. If all the median portion of the mandible is destroyed the two lateral fragments, although well maintained in position, act "en deux temps" individually; one of these fragments meeting the opposite molars before the other, synchronism ceasing to exist. It has to be reëstablished by forced exercises. (In other words, a very great deal of pressure brought to bear.) It is in this stage, too, that one must fight against the contraction of scars.

Fourth Stage.—The fourth stage consists in replacing the bones and the teeth that are missing—which might be termed the *mechanical.*

Importance of Each One of These Stages.—The four most important acts of prosthetic restorations are: Straightening, maintaining muscular equilibrium, dilatation of the scar, prosthesis.

Must they follow invariably in this order? Not necessarily. I think that the first diminishes and must lessen in importance in proportion as the wounded are sent directly from the ambulance, thanks to the wise steps taken by the Seventh Direction. I even think if the surgeon will call on our collaboration as soon as the wounded has recovered from his shock, there will be only a few exceptional cases where the straightening could not be effected. The principal thing is to keep the fragments in good occlusion. On this depends all the future mastication of the patient. Speech will even show the excellent effects of it and I would even say the appearance will be very much better. For whatever may be the extent of the wound, the restoration will be all the more perfect if the maxillary fragments have not deviated and function normally. By keeping these fragments in place one avoids their getting set in malposition by osteo-fibrous union. It frequently avoids the surgical intervention, often necessary, to readjust in their proper relations the fragments which have become so fixed in their malposition as to defy the forces brought to bear upon them by the stomatologist. (In other words, Dr. Frey wishes to emphatically convey the impression that a fixture applied to maintain normal occlusion does away with any necessity of having later on to perform a surgical operation to bring about such a result.) With the jaws held in their occlusion I have had occasion to observe, in spite of large losses of tissue, bony regenerations that have been most wonderful.

The third stage sometimes passes unperceived. As soon as the fragments are in good position, functioning can be reëstablished without any special intervention; but I cannot insist too strongly upon a constant and careful watchfulness. Muscular weaknesses may arise unexpectedly and the patient must be taught to observe his occlusion in a mirror. With the proper exercises he will learn to remedy certain partial malocclusions.

Regarding prosthesis, it is carried out either before or after the plastic operation. It is carried out before as a support to the plastic operation and follows when it replaces permanently the lost tissues. This latter prosthesis may replace a part of the maxilla with its teeth and it may even replace some of the soft tissues of the face.

The Apparatus.—What apparatus will be used during the four stages we have reviewed? The intermaxillary apparatus is intrabuccal, established between the two maxillaries. The point of support rests on one jaw, the force is exercised on the other or on a fragment of the other by means of the elasticity of rubber rings. On the upper jaw on each side a band is put around the molar teeth. To this band is soldered a little horizontal tube into the ends of which is fixed a metallic arch. This arch is ligated, of course, to all the teeth of the upper jaw. On this arch are soldered one or many little hooks. On the fragment of the inferior maxillary which one wishes to displace, one inserts bands and a small arch with hooks. In a word, the apparatus is like the one of the upper maxillary (excepting in many instance they are separate parts and not soldered together as one whole, they vary according to the case). These two systems of anchorage are united through the hooks by one or more rubber

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rings according to the intensity of the force to be employed and, on account of this continuous and progressive traction according to the number of rubber rings, the deviated fragment finds again its normal position.

This intermaxillary force is employed principally when there has been a loss of substance at the angle or a part of the body of the maxillary to reduce the lateral and retrogressive deviations of the maxillary. It is indicated when the retraction allows a certain mobility, otherwise, if there is absolute fixity, the intervention of the surgeon is imperative. When the teeth are missing on both maxillaries, or when they are too bad to bear the bands of the apparatus, or when both maxillaries, inferior and superior, are fractured, the point of support must be retained by the cranium. (Describes the unique apparatus made at the front for Ozanne's case.) The apparatus must be fixed very firmly, as it must remain in place for a long time. It must allow bony growth to take place, if possible, and the surgeon will often depend for the success of his case upon bone grafting, an operation which tends to find favor more and more in France and abroad.

As far as prosthetic restoration goes, I cannot add anything to the admirable book of Claude Martin (of Lyon). There is not a prosthetic dentist who is not a modest pupil of this wonderful genius, not only for the maxillary prosthesis, but also for the nasal prosthesis.

Judging from this short account it is very easy for one to realize the important part played by the dentist during this war, in which the wounds of the face and the maxillaries are so numerous.

4. Hayes, G. B, War Dental Surgery. *Dental Cosmos*, 1916, lviii, 249, 389, 511, 658, 758, 1012, 1143.

These articles consist of a most interesting and instructive series of case reports from the American Ambulance in Paris. To obtain real benefit from the articles they should be read in their original form. They are especially valuable on account of the illustrations, which cannot be presented here.

5. Herpin, A. Treatment of Fractures of the Lower Jaw at the Center of Bordeaux. *Gaz. Hebd. de Soc. Med. de Bordeaux.* xxxviii, 43–45.

Fractures are anatomically divided into two varieties—those of the horizontal ramus and those of the ascending ramus and angle.

In treatment, the aim should be reëstablishment of the function of mastication. This is only possible if the general equilibrium of the system is preserved, if the occlusion of the teeth is normal. And that can only be realized by reconstitution of the primary length of the bone.

In treatment, therefore, the first consideration is to reëstablish the normal occlusion of the teeth of the two jaws. For the horizontal ramus, we use, oftenest, ligation of the two arches with the mouth closed. The results are rapid and deviation of the body of the bone is reduced to a minimum. This is an excellent means of temporary treatment which insures security of the jaw while proceeding with permanent pieces. In case of overcrowding of wounded, we employ it systematically with this end in view, even when easy reduction would permit the immediate making of the permanent prosthesis. We thus avoid the deviations which might be formed during the waiting period. In certain favorable cases, the teeth being preserved, this immobilisation can be maintained until consolidation takes place.

After reduction has been effected, we immediately install the permanent prosthesis, whether this reduction has been made extemporaneously by means of ligature in old cases, by the apparatus of Angle, etc.; or whether in obstinate cases one has had recourse to a section of fibrous bands.

For this permanent prosthesis, we employ bridge apparatus; it is evident that the best procedure of retention is that which achieves, at the same time, the prosthetic replacement. Besides, thanks to employment of these bridge apparatus, the function of mastication is immediately reëstablished and the patient is in the best condition for bony repair to take place. These bridges are fixed, in most cases, and removable when they must have prolongations on the portions deprived of teeth.

For lesions of the angle and ascending ramus, we employ saddle apparatus (*volet*). These, in favorable cases, where reduction of the ascending ramus in its normal direction can be made from the first, are fixed. If this presents difficulties, the posterior saddle is provided with an arrangement which allows its progressive extension. Little by little the ascending ramus is thus pushed back and, by the

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resistance it presents, the anterior fragment finds itself naturally replaced in its normal situation of articulation.

To sum up, the apparatus that we employ are as limited in number as they are simple in construction. We lay stress upon reëstablishing function as rapidly as possible and, in order to do this, obtaining an absolutely accurate articulation of the two arches, which is only possible with a perfect reconstitution of the bone, in its dimensions, and in the direction of its different portions.

Although simple, these apparatus must not be the less formed and installed with an attention that leaves nothing to chance.

During nine months—June 1, 1916, to March 1, 1917—906 fractures have been treated at the center of Bordeaux according to these methods. The average duration of treatment is one month, with another month for convalescence. Grafts are not indicated for recent cases which have been immobilized immediately. The fragments are never brought together where there is loss of substance. Grafts are only indicated in old cases which have not had early and proper treatment.

6. Herpin, A, Chef. de Service de Stomatologie de la xviii Region. Treatment of Fractures of the Horizontal Portion of the Mandible. *Presse Medicale*, 1916.

The principal object of treatment of fractures of the mandible is restoration of the function of mastication. To bring this about, two conditions are essential: (1) Reconstitution of the normal occlusion of the teeth of the two jaws; (2) reconstruction of the arch of mandibular resistance. In fact, the displaced fragments should be replaced in good position and held until consolidation.

At the time of receipt of the wound, and immediately afterward, the fragments are mobile; they are reduced with the greatest facility, without pain, and the treatment then is reduced to the application of a suitable retaining appliance.

But it is rare, in practice, that the problem is presented with this simplicity; the evacuation of the wounded into the interior is slow, in the course of which the lesions grow worse; displacements are accentuated, the parts undergo adhesions which fix them in vicious position, and reduction becomes more and more difficult and complicated. Also, the duration of time required for treatment, easy and rapid at first, takes on an importance that tends to become preponderant. Various procedures have been invented; different apparatus for a slow reduction, which may last for weeks or months. The resistances to be overcome are often considerable, conditions unfavorable, and one thus often only achieves an approximate final result. The teeth may be in contact, but the masticating surfaces no longer exactly correspond, the bone being most often everted under the influence of the pressure or traction which has only been able to operate definitely on the teeth, and which have no efficacious action upon the bone itself. Besides, the splints which avoid normal contact of the teeth of the two jaws are not without ill effect upon the ultimate occlusion of these organs. No matter the care with which a splint has been articulated, most often, when one removes it, a deviation is found which is always very difficult to reduce. Besides, the result can very easily not be permanent. Stretched and undestroyed bands often tend to bring back the bone into its vicious situation, as soon as the action of the apparatus is discontinued.

For these reasons we believe preferable, immediate, quick surgical reduction, followed by immobilization of the fragments. It is a benign intervention, section of a few fibro-mucous bands cannot cause an appreciable shock; in any case, the betterment of the general condition of the patient, rapidly regaining an essential function, sets off largely any possible inconvenience; on the contrary, it can only be mediocre in those who, fatigued by wearing tiresome painful apparatus, can only receive, on the other hand, insufficient substantial diet, their ability to masticate being reduced or suppressed. This intervention should only be performed upon the soft tissues; the bony parts, even isolated, which one sees so frequently serve as guides to new bone formation, must be respected.

This liberation leads us back to the conditions which we had at first, those of the moment which followed receipt of the wound. Nothing remains but to see to the retaining in good position.

In cases of fracture of the horizontal portion with preservation of some teeth on either side of the loss of substance, cases which are happily the most frequent, it has appeared to us possible to employ apparatus which realizes both fixation and indispensable restorative prothesis. These two conditions are fulfilled by bridges fixed solidly on the dental abuttments; absolutely rigid, they are capable of retaining the fragments in an efficient manner, reconstituting thus an efficient mandibular arch.

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Furthermore, they carry artificial teeth, and the patient can retain them indefinitely. They should be constructed in such a manner that the linear length of the arch is reestablished in rigorously exact fashion; under these conditions the teeth take their normal occlusion and deviation is not observed. In cases favorable from the first, a bridge of a single piece is made; if intervention has been necessary, one can, if need be, in complicated cases establish a bridge in sections, two lateral portions corresponding to the preserved teeth, and which is attached to them before the operation—and a central portion which is united to the two others right after the operation. They are assembled by means of screws and grooves installed in such a manner that the entire piece has perfect rigidity. Immediately after placing these appliances the patient can go back to normal diet and the difficulties of swallowing and phonation are done away with. The employment of these apparatus has never given us anything but satisfaction.

The consolidation of war fractures of the lower jaw can only be brought about by a very considerable new bone formation, to fill the breach caused by the traumatism. The process of repaid is fairly long, but this fact does not entail great difficulties, since from the start of treatment function is reëstablished. We have had occasion to observe that consolidation was more frequent and more rapid in cases submitted to the foregoing treatment. The time of repair varies, but we have seen new bone formation of 4½ cm. produced in 2½ months.

The last two conditions are fulfilled by fixed bridge apparatus. We consider that osteogenic evolution will be so much the more favorable as the fracture is situated in front of the last molar. Moreover, new bone formation always occurs from behind forward for each half of the mandible, progressing toward the anterior fragment; the anterior portions are in fact deprived of sufficient nutrition. Nutrition and blood supply are augmented by normal functioning of the jaws.

It is preferable to avoid, whenever possible, the lacing of the upper and lower jaws together, as this creates a local anemia. As to the grafts which have been attempted, the results have not yet been very well demonstrated. One should be very reserved in employing them, and they are only found necessary in a limited number of cases.

7. Herpin, A. Fractures of the Angle and of the Ascending Ramus of the Mandible. *Presse Medicale*, 1916.

The ascending ramus, after bony section, is drawn principally upward, and its direction becomes oblique forward and downward. If consolidation occurs under these conditions, the equilibrium of the entire bone is destroyed. The corresponding horizontal fragment is at its posterior extremity brought upward and backward, causing a marked obliquity, whence arise a limitation of opening on the affected side and muscular disequilibrium betraying itself by diminution of function.

The shortening of the arch does not permit the normal articulation of the teeth; besides, the implantation of the latter not having changed, they take on oblique direction upward and forward, and pressure is no longer exerted in the direction of greatest resistance, consequently there is a tendency to dislocate the teeth forward in the course of mastication; lesions of rarefying osteitis become manifest about the roots; the teeth loosen and fall out. Fixed or removable prostheses thus have supports of diminished resistance which soon are lost. Mastication is impossible on these teeth painful to pressure and, by their premature disappearance, is found to be gravely interfered with. Also in most cases the mobility resulting from the non-fixation favors the production of a pseudarthrosis; the deviation of the anterior fragment necessitates the employment of special apparatus, with rods, destined to put it in good articulation. But this prosthesis is only a palliative, which makes a lesion that has become permanent. The patient is condemned indefinitely to wear complicated prostheses. A marked deviation persists on opening the mouth.

The first care, then, should be to avoid the establishment of these lesions, and consequently the employment of these improvised means of correction.

If, from the moment of arrival of the patient, the position taken by the ascending ramus is considered, if its deviation is reduced, if this reduction is maintained, ths general mechanism of the system is reëstablished in its integrity. These resulte are easily attained. For a short time after the receipt of the wound, reduction is easy. After this, there is nothing further to do than to apply an apparatus (*à volet*) supported on the preserved teeth and carrying a sort of saddle of vulcanite, which adjusts itself on the anterior border and the inner surface of the ascending ramus. If the apparatus is constructed with care, in such a way as to reëstablish the articu-

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lation perfectly, to maintain the ramus in a direction exactly parallel with that of the healthy side, the exact length of the mandible is reestablished. The pressure exerted on the ramus suffices to lead the remaining teeth into good occlusion, and from the moment of placing it in the mouth the patient can have normal mastication. The apparatus, well adjusted, is always well borne. We employ a removable piece, which allows observation of the tolerance of the mucous membrane. In certain cases, where reduction is less easy, the piece is installed on a slide with an eccentric screw, permitting the forcing back of the ascending ramus and, at the same time, forward and outward, the horizontal ramus. We have found that, treated in this manner, the fractures have a tendency to consolidate rapidly. The waiting period, moreover, is bearable, thanks to the immediate reëstablishment of function.

8. Imbert L., and Real, P. Unilateral Fractures of Mandible with Loss of Substance. Their Treatment by the Swinging Forward of the Posterior Fragment. *Brit. Dent. Jour.*, 1917, xxxviii, 45-52.

These authors believe it necessary to obtain approximation of bony fragments at the expense of restoration of normal contour of the bone, thus avoiding fibrous union and pseudarthrosis.

Summary.—1. It is of the utmost importance, in order to secure consolidation of the fracture, to draw together the fragments.

2. The shrinkage of the jaw which results from this is of minor importance, even where there has been loss of continuity amounting to as much as 2½ or 3 cm.

3. This shrinkage is no obstacle to reëstablishment of function, for the normal movements of the temporo-mandibular articulation admit of remedying the defects of occlusion.

The authors use crowns on the teeth of the posterior fragment, to which are soldered wires with a jackscrew attachment to a wire arch fitting inside or outside the teeth of the anterior fragment. Deviation of the anterior fragment is corrected by intermaxillary elastic traction.

9. Kazanjian, V. H. Immediate Treatment of Gunshot Fractures of the Jaws. *Jour. Allied Dental Soc.*, N. Y., 1917, xii, 29-48.

Actual destruction and loss of soft tissues in gunshot injuries of face are uncommon, and torn and separated borders of very large wounds can usually be traced.

Many soldiers, when wounded in jaws, do not lose consciousness, but are able to take care of themselves to the extent of stopping hemorrhage, and even of walking some distance to have wounds dressed. When found unconscious and bleeding freely, they receive field dressing and are sent along to base hospitals within two or four days. Wounds are always septic and inflamed. Even the slightly wounded show weakness and fatigue, and the seriously wounded are very ill. Effective care and prophylactic treatment, proper diet, frequent dressings, etc., reduce temperature, but for the first two or three weeks the patient is very weak. Recovery of strength is gradual and may be marked by bronchial and tonsillar infections.

A conservative estimate of time for recovery from fractures is two to nine months.

If the injuries are limited to the jaws and mouth, prognosis as to life is good.

Conditions which may cause immediate death are:

1. Secondary hemorrhage. Extreme care and watchfulness are necessary for this.

2. Extensive inflammation and suppuration in mouth may cause pneumonia.

3. Extensive fracture of upper jaw may involve cranial bones and lead to brain complications.

Treatment.—The presence of dangerous illness may be the first consideration. As soon as the general condition warrants it, the proper steps are taken to restore the normal function of the jaws and reduce possible deformities of the face.

Methods used are:

1. Care of mouth and external wound.
2. Diet.
3. Operative procedure.
4. Splints and immobilization of bones.

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1. *Care of Mouth and External Wound.*—Before arrival at general hospital, patient has received such treatment as will arrest primary hemorrhage and clean wounds and mouth.

On arrival at general hospital, usually within three or four days, patient is put to bed. Free drainage of external wounds and hypochlorous acid (eusol) dressings applied in form of hot fomentations. Until initial shock and weakness have disappeared, no immediate attempt by operation is made to suture soft parts, set bones, or remove foreign body, except operations necessary to save life. Hypnotics are given for pain, and cathartics for bowels.

To establish and maintain cleanliness of the mouth:

(*a*) Tinct. iodine applied two or three times a week to gums and teeth on small cotton wads.

(*b*) Pledgets of cotton saturated with hydrogen peroxide and rubbed over teeth and all mucous surfaces twice daily.

(*c*) Mouth is irrigated with an antiseptic fluid three or four times a day.

(*d*) Hard deposits scaled from teeth and surfaces polished. Mouth gradually cleared of broken roots and fragments. When able, patient cleans own teeth with brush.

(*e*) Wounds of the mouth are at times packed with iodised gauze, changed frequently.

(*f*) For excessive salivation, hand saliva ejectors are used by the patient.

(*g*) To facilitate the removal of pus, sputum and dried secretions, etc., exposed parts are sprayed with

Ol. menth. pip.	M ss
Liq. cresol. comp.	M ij
Paraff. liq.	Oz j

2 *Diet.*—Liquid food is given either through a porcelain feeder or through a rubber tube which can be carried far back in the mouth. Patient loses weight at first, but even on liquid diet for two or three months he begins to gain steadily.

SUMMARY OF DIETARY

Acute Injury of Jaw

Liquid through esophageal tube or mouth tube.
Every 2 hours during day.
Every 4 hours during night.
Milk, 1 pt., egg 1, or strong soup, or Benger's food, with egg or Bovril made with milk, or thin arrowroot with Valentines meat juice, or boiled custard with addition of stimulants—brandy or port wine as ordered.
Basis of dietary, 24 hours.
Milk, 4 pts.; eggs, 4; soup, 2 pts.

Semiliquid Dietary for Convalescent Patients

Same as above in 4 hourly feeds.
In addition:
Baked custard.
Strained fruit juice or stewed fruit.
Jelly.
Benger's food.
Bread and milk.
Porridge (per diem).

Convalescent—Semisolid

Breakfast: 7.45 a. m.
Porridge 1 pt., milk 1 pt., sugar. Tea, thin bread and butter. Alternative bread and milk or gruel.

Luncheon: 11.00 a. m.
Bread and milk or beef tea with bread.

Dinner: 1.00 p. m.
Minced meat, mashed potatoes, greens. Milk pudding.

Tea: 4.00 p. m.
Tea, or bread and milk; 2 eggs lightly boiled, poached, fried or scrambled. Bread and butter.

Supper: 7.00 p. m.
Cocoa 1 pt., or bread and milk.

3. *Operative Procedures.*

Removal of foreign substances.—In order to control suppuration it is necessary to remove all irritating agents, such as bullets, affected teeth and roots, and loose fragments of bone. Fractured alveolar process is not worth saving, nor teeth and roots involved in the fracture, nor loose and scattered fragments of bone.

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Ascertain the path of the projectile, so as to know beforehand all possible sources of bleeding.

Bleeding from the lingual artery may often be controlled by local packing frequently repeated. A specially devised lingual clamp is also useful. This consists of a piece of heavy wire 8 or 10 inches long bent to a "U" shape, with a finger of modelling compound or vulcanite on each end. One end passes under the tongue and the other under the chin, with an elastic band to make pressure.

One-fifth of the patients with fractured jaws develop bronchitis or bronchopneumonia. This is often due to use of general anesthesia in these septic mouth cases for operations on other parts of the body. Always clean and irrigate the mouth before general anesthesia. Avoid morphine when possible as it may paralyze the laryngeal reflex. Use atropine alone for preanesthetic medication. Keep patient in sitting position if possible.

Abscess and Necrosis.—Extra and intraoral drainage are essential.

Development of secondary abscesses can be largely avoided by strict attention to the hygiene of the mouth and careful removal of all foreign bodies and detached fragments. Free drainage is essential until all suppuration stops.

Local Anesthesia.—Cannot be overestimated in value. By conductive or infiltrative methods, wounds may be curetted; teeth, loose alveolar process, and superficially embedded foreign bodies removed; abscesses opened; perforations of the palate sutured; muscular and fibrous adhesions cut; displacements reduced in the adjustment of splints, and smaller plastic operations performed.

Plastic Operations.—No attempt should be made to suture the soft parts with the idea of closing a gap until such time as union of the fractured parts in correct relation is well under way and permanent splints are adjusted. The reasons for this are that wounds are always septic at first stages, displacement of fragments is nearly always present, and the muscles of the face are nearly always in constant tension. As a result any wound involving lips or cheek is magnified. On the other hand, if mouth is cleaned, infection controlled, and displacement reduced, disfigurement will be much less and therefore easier to rectify. Long delay is not necessary nor should we wait until scar tissue is formed. As soon as splints are adjusted and wounds show healthy granulation, parts should be sutured to obtain minimum scar tissue.

Facial supports are of great assistance in moulding the parts and supporting the sutures. A simple support is made in the following manner—ordinary hooks are sewed close together to the edge of strong bandage material. A piece of this is stuck to the face with collodion on either side of the sutured portion of the soft tissue and the two laced together with silk. Or hooks may be sewed to adhesive tape.

Another form of facial support is one in which a series of plates of vulcanized rubber, held in place about the face and cheeks by head gear, serves as a base. To this are attached heavy wires, with vulcanite fingers on the ends to press the tissues at certain places and offset muscular tension. There are many possibilities for additions and variations, such as tubes to serve as nostrils, etc.

4. *Immobilization of the Bones.*—This is done preferably within a few days, while the fractured parts can be moved freely. Permanent splints cannot always be applied in the early stages, but temporary attachments can generally be made. *The guide for correct immobilization of the maxillary bones is the former occlusion of the teeth. This cannot be over-emphasized.*

Classification of Fractures.—(*a*) Single fractures anterior to last existing tooth. The ease and speed of making render the jacket vulcanite splint especially adaptable for military surgery. Consists of vulcanized rubber over teeth adjacent to fracture, having fractured parts connected by heavy wire vulcanized into rubber. Cemented on teeth.

Cast or swaged jacket splints of gold, aluminum, or german silver are superior to vulcanite, but construction is more difficult.

Band and wire splint, by fitting bands to selected teeth and connecting by wire clingually or bucally to them, is an excellent appliance. The different steps in preparation, however, may cause discomfort to the patient if his condition is weak.

(*b*) Multiple fractures anterior to last existing tooth. Usually much displacement. Under favorable conditions, the types of splint described for class (a) may be used, but if assembly is difficult, a sectional band and wire splint may be used. This means two band and wire splints, applied to selected teeth in each fractured

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portion, with corrugated arch wires elongated anteriorly to pass each other at median line. Then wire or silk ligatures bind the overlapping wires firmly together.

(c) Fractures posterior to the last existing tooth. These involve fractures of the body of the bone, ramus or condyle. Immobilization is secured by using the superior maxilla as anchorage and occlusal guide. If this is done, patient cannot masticate, and drainage of septic mouths is interfered with. Immobilization may also be followed by ankylosis. Removable intermaxillary splints are therefore desirable until wounds have healed.

1. Intermaxillary (Gunning) splint of vulcanite or metal, is easily removable and suited as temporary splint.

2. Intermaxillary ligation by metal, or band and wire splints. Ligatures may be removed and mouth opened at any time.

3. Interdental ligation with fine brass wires applied directly to the teeth has limited field in war fractures, except occasionally as temporary measure.

In injury of the joint or neck of condyle, permanent immobilization must be avoided. The mandible should be at rest, yet moderate movement encouraged. The intermaxillary wiring used in other fractures should be replaced by elastic ligatures.

Modelling composition may be attached to splints to mold and build out soft parts.

Fractures of Maxilla or Upper Jaw.—Modified Kingsley bar splint attached to head straps.

Treatment of Delayed Cases.—Reduction and fixation brought about by

1. Continuous force by use of springs and rubber bands.
2. Jackscrew.
3. Inclined planes.

Bandages.—The most useful is the Barton bandage. The turn under the chin is passed in the direction in which force is required.

10. Massobrio, G. War Fractures of the Mandible and their Surgical Treatment. *Policlin*, Rome, 1917, xxiv, 993.

The author thinks that displacement of the ascending branch of the mandible is especially grave, and that its reduction is a problem not yet solved by many surgeons. The author is inclined to think that this could be effected by nail extension applied precisely on the ascending branch of the mandible.

When there is loss of substance, it is best not to attempt grafting in the first instance, but while the fragments are maintained in position, to allow periosteal regeneration. The periosteum, according to the author's observation, can, when its functions are not interfered with, reproduce a large portion of the lost bone, and a dental prosthesis only, will finally be necessary. When such a regeneration fails, it will then be time enough to resort to bone or cartilage grafts. This should be done as a late operation, when all inflammatory reaction has ceased. The surgical treatment of mandibular fractures thus resolves itself into a first stage of mechanical prosthesis, and a later stage of bone substitution. In the author's opinion, too little attention has been given to internal prosthesis.

11. Pickerill, H. P. Treatment of Fractures of the Mandible Accompanying Gun-shot Wounds. *Dominion Dental Journal*, 1917, xxix, 217.

Fractures of the anterior portion of the jaw involving the incisor region lead to (1) narrowing of the arch of the jaw, and (2) twisting inwards of each horizontal ramus, brought about chiefly by the action of the mylohyoid muscle.

Fractures of the posterior portion of the mandible lead to (1) considerable elevation of the posterior fragment (temporal and masseter muscles), (2) retraction and deflection of the chin; (3) depression of the larger fragment on the injured side. (2) and (3) are due to the unopposed actions of the geniohyoid, hyoglossus, and mylohyoid muscles. As part of the conditions bearing upon treatment, it has to be remembered that many of the men have either (1) lost a large number of teeth; (2) have a large number of septic teeth present; or (3) were wearing dentures, which disappeared at the time of injury.

Suggested Immediate Methodsof Treatment.— 1. *Splint.* Modified Kingsley splint adopted by the New Zealand Government. Made of nickle-silver, glided, and consists of a body and two arms. The body is concave and molded to the shape of a

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dental arch. Arms are made of stout wire soldered to body. The concavity is filled with modelling composition. The splints are made in three sizes, small, medium, and large. The Pickerill splint provides a ready-made splint for any case. It can be used for simple and compound fractures and also in cases where a portion of the bone is missing, to maintain the relative position of the two fragments, and especially to counteract the upward displacement of the posterior fragment. It can be removed and replaced without difficulty for dressing wounds. It may be used advantageously in combination with wiring.

Directions for Use.—(1) Splints are provided in three sizes, large, medium, and small. Select one which is of the approximate size required. (2) Remove the modelling composition by placing the splint in hot water. (3) Try splint in mouth over teeth. If too deep at any point, trim down with the scissors provided, leaving no sharp edges. Make any other adaptation with the pliers provided. (4) Heat the composition in hot water and replace in the dried and warm splint. Whilst the composition is still warm, press splint down into position over the teeth and jaw, observing (i) that the composition is not too hot, (ii) that the fragments are in normal position. (5) Pass a bandage under the mandible up between each arm of the splint and the cheek, over the arm and down under the mandible and tie it firmly. The jaw is thus securely clamped. (A pair of pliers and a pair of small metal scissors are sent with each batch of splints.)

2. *Intermaxillary Lacing.*—Two horizontal ligatures are first passed through the interdental spaces between the canine and first premolar, and the second premolar and first molar in both jaws, so as to include the two premolar teeth. This should be done on both sides of the jaw. Horizontal ligatures are then connected by vertical ligatures, all the wires being applied quite loosely. The horizontal wires are next tightened, and then the lower teeth are made to articulate absolutely accurately with the upper teeth, and while in this position the vertical wires are tightened and the jaw thus immobilized. The method may be used as a temporary measure in all fractures of the mandible. The vertical wire ligatures are left on for three weeks, after which in some cases they may be removed and passive movements allowed; they may be replaced by silk ligatures as easier to apply. The horizontal ligature is continued until the sixth week, especially during the time the patient sleeps, in order to prevent yawning, as the latter does far more harm than even a small amount of mastication. In the absence of teeth, intermaxillary lacing is carried out as follows: (1) Holes are drilled through the jaw at the level of the roots of the teeth, and about ¾ inch away from each fracture line. Stout silver wire is then passed through the holes, and the fragments approximated if possible. (2) Further holes are drilled in the region of the lateral incisors in both upper and lower jaws, or in other suitable positions, according to the site of the fracture, and silver wire passed through both. The mandible is brought into the desired position, and the wire tightened by twisting.

3. *Submandibular Screws and Wire Splint.*—In cases in which none of the other above described methods are available for some reason, such as an extremely septic mouth or the loss of much alveolar process, the following method may be adopted:

(1) A very stout piece of German silver (or even iron) wire is obtained and bent to the shape of the lower border of the mandible—as the latter should be normally, and extending from angle to angle. Four steel screws 1 inch or 1½ inches long, and preferably nickel plated, are required, and some fine silver or brass wire for ligatures. (2) The skin under the mandible is sterilized, and four small incisions made directly over the lower border of the bone, two on each side of the fracture line (avoiding the facial arteries). Holes are bored in the bone for the reception of the screws, and the latter screwed in for about half an inch. The stout wire splint is then ligatured firmly to the four screws with fine ligature wire, and the mandible securely clamped. Every effort is made to prevent infection from reaching the screws, or they may become loose before the fracture has united. The stout wire should be notched in the region of the screws, so that the wire ligatures will not slip.

12. Pont, M. A. Treatment of Fractures of the Lower Jaw. *Lyon, Méd.*, 1916, cxxv, 294.

Fractures of the mandible can be divided into three categories:

(*a*) Recent, without loss of substance; (*b*). old without loss of substance; (*c*) Old or recent with loss of substance.

1. Recent fractures without loss of substance.—These, being handled in time in special centers, unite in perfect manner in all or nearly all cases.

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In no case should one employ bony suture or retention plates in the treatment of these fractures. It is always better to reduce the fragments and maintain them in good position by means of retention apparatus. The most simple and preferable apparatus is the metal arch or the arch of Angle which has the advantage of not requiring preliminary impressions and of serving at the same time for reduction and retention.

2. Old fractures without loss of substance.—In this variety of fractures, the fragments are in general overriding and deviated. Two methods are employed to re-establish the normal occlusion of the teeth.

(*a*) The slow or prosthetic method by means of apparatus of reduction, then of retention.

(*b*) Rapid or surgical method (osteotomy) employed when the osseous callus is too old, and the fracture cannot be reduced by prosthetic apparatus.

The technique is as follows: After cutaneous incision the mandible is bared, and with the help of a simple gouge inserted in the line of fracture the fragments are separated. It is preferable not to employ the Gigli saw, this procedure being able to provoke later formation of secondary fragments with suppuration and pseudarthrosis. The mobility and the reduction of the fragments being thus obtained, one proceeds to the immediate placing of the retention apparatus.

3. Old or recent fractures with loss of substance.—Following these fractures a pseudarthrosis is usually observed. Different procedures have been employed to combat this pseudarthrosis. I eliminate at once the osseous suture which immobilises the jaw badly. The plate of Lambotte can give at times appreciable results, but has the great disadvantage of not reëstablishing normally the dental articulation. Besides, these means of retention are, in general, badly tolerated, and I have been obliged generally to remove them to avoid an abundant suppuration and the elimination of sequestra.

I prefer to employ the bony graft, which up to now has given me good and quickly appreciable results.

The first time that I tried this operation, with the aid of Dr. Patel, the graft was removed from the cartilage of the eighth rib. This graft was thrown off three weeks after the operation. Nevertheless the result obtained was satisfying from the point of view of bony consolidation. This patient has now a dental apparatus with which he masticates very well. But the removal of the costal graft presents some dangers. It is then preferable to take it from another part of the body and in particular from one of the bones of the leg.

For the bony graft of the mandible, it seems that the tibia is preferable to the fibula. It is not necessary to have a voluminous graft. On the other hand, a special technique allows the graft to be removed without too much harming the tibia. It is removed generally from the antero-internal surface of this bone. For this purpose I employ the technique of Dr. Bryan, of New York. The surgeon uses a double circular saw driven by an electric motor. I have simplified and slightly modified this method. Never should bone grafting be performed hastily, and in certain cases it should be renounced absolutely. In fact, for this procedure to give appreciable results, it is indispensable to be sure of perfect fixation; it is necessary then that there be teeth solidly implanted behind the line of fracture. I employ two metallic arches, one placed on the superior maxilla, the other on the inferior, and solidly ligatured between them. The mouth is thus maintained in perfect occlusion. This procedure, which carries the name of "blocking," has been employed not only for the retention of the bony graft, but also in the cases of fracture difficult to retain in perfect immobilization. It is not always without hesitation that I have practiced it. I feared troubles of nutrition in wounded already debilitated, their nourishment being thus rendered particularly difficult. The patient should be over-fed, the food being liquid or semiliquid.

Here is the diet of the "blocked" at Hospital 19: 3 liters of milk; 4 eggs, 1 liter of bouillon; 100 grams of meat juice; 1 quart of wine. The patients are weighed every four days and, in every case except one, the weight has been maintained and even sometimes augmented.

Cases of bony regeneration have been demonstrated among patients with pseudarthroses, with large losses of substance, when immobilization of the jaws had been maintained during several months.

On the other hand, it is often impossible to perform bone grafting, particularly in older patients. The bones have no longer the vitality necessary to recon-

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struct themselves, and further, the blocking can bring about serious stomach troubles in these patients, more weakened than others who are younger and better able to bear this special feeding. In these cases I replace the missing part by a gold bridge fixed solidly to the existing teeth, and upon which is placed the prosthetic dental apparatus.

13. PULLEN, H. A. A Quickly Adjustable Fracture Band, and its Possibilities in War Dental Surgery. *Internat. Jour. Orthodontia*, St. Louis, 1917, iii, 139-141.

German silver band (thin gauge) which has soldered across each end a short curved section of heavy German silver wire, which, by reason of the projecting horns thus formed, is readily ligated on the labial or the buccal surface of a tooth by twisting brass wire around the horns. The band automatically conforms to the narrow neck of a tooth by twisting of the labial ligature as the force is exerted in parallel lines across the horns, and continues to tighten the gingival edge of the band after it has already become tight at the coronal edge, preventing the band from slipping off under the strain of ligatures from the opposite jaw.

Bands of this form could be joined together with a section of a heavy soft solder wire, to be used as an arch between the fractured sections as a temporary splint.

14. SCHROEDER, H. On the Treatment of Wounds of the Jaws in Field and Base hospitals. *Beitr. z. klin. Chir.*, 1915, xcvii, 320.

In ordinary times, the stationary nature of trench warfare permits of the complete handling of these cases in the hospitals near the front. In times of stress and congestion, most wounds of the jaws must often be passed farther back for complete treatment, after an emergency dressing has been applied in the field hospital.

The fixation apparatus employed in the majority of cases is the Sauer wire splint, with or without inclined planes. The splint, consisting of a wire arch on the bucco-labial surfaces of the teeth alone or passing around on to the lingual surface as well, is fixed to certain teeth by means of clamp bands. These bands resemble those known in America as the Usona type, and differ from the Angle bands in that they are heavier, and the bolt drawing together the clamp is on the buccal side of the tooth, and is hollow, forming a tube for the reception of the wire arch. The arch is also firmly ligated to the teeth intervening between the bands with fine wire. Where moderate loss of bone substance is present, elastic traction is made use of by rubber bands passing obliquely from the upper to the lower teeth, in order to restore the correct occlusion. For cases with extensive loss of substance, the emergency dental equipment chest is provided with artificial hard rubber jaws, to be used as temporary prosthesis.

The author is a strong advocate of the principle that in every patient with jaw fracture, whatever the method of treatment employed, under all conditions the normal articulation of the denture must be preserved.

Fourteen cases are very fully described, illustrating the author's methods of treatment under various conditions. In one case of fracture of the lower jaw, with considerable lateral loss of substance and deviation of the greater fragment to the injured side, the normal position was restored by means of elastic and adhesive plaster traction, the distal end of the elastic being attached to a chair beside the bed.

15. VALADIER, A. C., and WHALE, H. L. Report on Oral and Plastic Surgery, and on Prosthetic Appliances. *Brit. Jour. Surg.*, July, 1917.

These authors believe in the early closure of the soft tissues, by flaps if necessary, at the same time preserving the original contour of the bone by means of splints, building out with modelling composition, etc.

Extensive experience in gunshot fractures of the jaws has shown that each case must be treated as one *sui generis*. The plastic side of the work is most important. Oral and plastic work are mutually interdependent.

The following principles are formulated:

1. All remaining teeth should be preserved as far as possible, even old roots may be kept and filled, and may prove useful in providing support for interdental splints. Teeth directly in the line of fracture should be removed, but more conservatism should be observed in regard to the teeth than is usual.

2. In extensive injuries of the face, the wounds should be closed as soon as

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possible; if necessary, before placing the jaws in position. The wound should be closed long before it is thoroughly clean. Two layers of sutures, one deep and one superficial, are used. Drainage of the mouth should be obtained by a median submaxillary stab wound into which a rubber tube is inserted. *Where there has been a loss of tissue in the upper or lower lip*, however, it is unwise to draw the edges together.

3. Where the initial closure of the soft parts precedes the orthodontal correction, there is a strong tendency for the soft parts to shrink into cicatrization. This renders work on the jaw itself difficult or impossible and, to prevent it, interdental appliances, to which wire has been attached for the grasping of modelling composition, must be inserted, and increased, if necessary, to preserve the contour.

4. Superficial sutures must not be subjected to undue tension, even if complete apposition of the wound edges is not obtained.

Prosthetic Appliances.—Cases differ so much that the decision in each instance must remain with the operator. Endeavors should be made to keep the appliance as simple as possible, avoiding unnecessarily complicated methods.

Trismus can be treated satisfactorily without complicated appliances. Treatment by plain wooden wedges, larger sizes being provided progressively, should give satisfactory response to treatment within five or six days at the utmost.

CHIEF COMPLICATIONS AND SEQUELAE

1. *Secondary Hemorrhage.*—A slight oozing is fairly common. Out of 1,010 cases, it has been necessary to tie an artery in its continuity through a fresh incision in only 11. In severe bleeding, the routine practice is to tie at once the external carotid artery just above the origin of the superior thyroid.

2. *Tracheotomy.*—This has only been done in 2 out of the 1,010 cases.

3. *Lung Complications.*—The large majority of fractures are compound, both into the mouth and outward, and only reach us 2 or 3 days after infliction of the injury, in a very fetid state. The relative rarity of lung complications is therefore striking. Only one rib resection for empyema has been made. For two years the author has been cleaning all jaw injuries with boiled water, avoiding antiseptics as much as possible.

4. *Infections of Adjacent Structures.*—In the series, there was one case of erysipelas, one of maxillary sinusitis, and two quinsies.

5. *Grave Local and General Sepsis.*—One case died of streptococcal septicemia, one of septic meningitis, and one of general pyemia. Two patients died of mediastinitis, which spread from a retropharyngeal abscess in the track of the missile. Of 1,010 cases of jaw and facial injuries there were 27 deaths; of these 7 were beyond saving on their arrival.

REPORT BY CAPTAIN WHALE

At the primary operation, all tissues not hopelessly dead should be conserved. Especially does this apply to:

1. Bone and mucous membrane. Preservation of these structures may obviate the necessity of transplantation in the case of bone and of extensive sliding flaps in the case of mucosa, the loss of viability of either of these never being certain.

2. Parts of the face which are difficult to build up artificially, such as columella or alar margin of the nose. In war injuries we are dealing with inelastic and sometimes avascular cicatricial tissue, less tolerant of repeated interference than normal tissue. In view of this (*a*) provided we have obtained a good vermilion border—if the parts break down, or the cosmetic result is imperfect, it is better to let the lip heal in so far as it will, and later to perform minor operations; (*b*) a destroyed columella usually cannot be reconstructed by the convenient flap from the upper lip, since the wound has as a rule involved this lip also. Having restored the lip, it is unwise to disturb it again; and the columella must be made from the face by the French method, or, better, from a hairless part of the arm or forearm by the Italian method.

Before finally or completely covering in a loss of skin in the region of the jaw, the buccal cavity should have been shut off, by nature's granulations or surgeon's stitches, or both. If this has not occurred, then if the gap be closed by undercutting and sliding adjacent skin, a troublesome salivary fistula results. Such cases may be successfully dealt with by sutures of heavy catgut which embrace the deep structures only and do not reach either the mouth or the skin surface. But if, in order to close such a gap, it has been necessary to swing up a long pedicled flap

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from the thoracic wall, the evil results of an unclosed communication with the mouth are much more marked. The distal end of the flap may slough away and, although the proximal part heals, its healing is attended by gross keloid formation, owing to the constant reinfection.

Whoever practices plastic facial work would do well not to adhere implicitly to text-book directions, thus:

1. The time which should elapse between successive steps of surgical procedures can only be ascertained by experiment. In general, it may be said that primary closure of the wound is undertaken too late, and all subsequent stages too early. In particular, pedicles of transplanted flaps can rarely be divided safely after 10 or 14 days, as often stated; three weeks is as a rule a minimum.

2. The margin allowed for shrinkage of flaps is commonly given as 1/6 area. In our experience, 1/3 is more accurate; *i.e.*, a piece of soft tissue should be cut one-third larger than it is ultimately intended to be. It must be remembered that the flap continues to shrink for many weeks, and in all diameters. Thus, a nose made from the frontal tissue shrinks upwards towards its pedicle, so as to be too high on the face; and the piece fashioned for the columella may shrink until it is not long enough to reach the lip.

In making a nose from a forehead flap containing a previously implanted rib cartilage, it is debatable whether the latter should be grafted superficial or deep to the periosteum.

For building up smaller gaps in the nasal bridge after subtotal loss of the nose, it is useful to swing up a vertical strip from the cut anterior edge of the cartilaginous septum. This strip remains attached to the septum at its upper end. The later stages of fashioning a nose by the Indian (forehead flap) method involve reducing its thickness between the eyes, and creating the natural depression just above each ala. Such effects may be produced by excising pieces of skin in a wedge shape, so that on suturing with horsehair (a mattress suture is useful) the area is inverted. The superficial aspect of the excised piece is elliptical, and the depression produced is most marked at the widest part of the ellipse, gradually fading away toward its ends. By varying the relative length and width of the ellipse, and the slope of its edges, any sort of dimple, valley, or crease may be created.

After a wound in the region of the mandible, or at any stage of its surgical correction, an elevation or depression of one angle of the mouth is a frequent occurrence. When this is due to cicatricial contraction there is no special point to emphasize here. But there are two causes for such asymetry which call for remark:

1. Sometimes, after an extensive comminuted fracture of the lower jaw, with more or less loss of bone, it is impossible to maintain accurate apposition of the fragments, by any form of splint, and these fragments are often sufficiently viable to form callus, but will not tolerate wiring. There will be a dip in the level of the jaw on one side, dragging the angle of the mouth down with it. In such cases some form of bridge to raise the level of the depressed part is advisable, and on this bridge a denture is constructed. The angle of the mouth is now brought up by operation. It will often be noticed that the mouth may have eventually a false relation to the jaw on that side, but the dental occlusion nevertheless is perfect, and the mouth straight. This is a better plan than to try to raise jaw and mouth together.

2. Destruction by an external wound of the facial nerve in the parotid region. A completely successful result from anastomosis of the nerve with one of its neighbors is rare. Here again, it is better to lift the mouth angle by a plastic operation. The mouth in repose is then absolutely straight, and the patient's only obvious disability is a whimsically crooked smile.

ANKYLOSIS, TRISMUS, ETC.

1. Herpin, A. A Simple Jaw Stretcher. *Presse Medicale*, May 8, 1916.

The apparatus depicted in the illustration is made of two pieces of hard wood, 30 cm. in length, fastened together by means of a simple hinge, which permits of an opening of the jaws of the instrument to an extent of 5 cm. The handles serve as levers and throughout half of their length beginning at the hinge, have a series of notches cut in them. These notches accommodate rings of rubber which regulate the opening of the jaws of the instrument, more or less great and energetic, according to the distance of application of the elastic traction from the hinge. The jaws of the instrument on their internal and external surfaces are covered with a plate of German

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silver, and on this is stamped a semicircular ridge, in order to allow the retention of the stretcher between the teeth of the two jaws.

With this apparatus, traction can be varied according to need; the number of rubber rings can be augmented. But in most cases one is sufficient, with two sittings of a quarter of an hour each, one in the morning, the other in the afternoon, to serve in most cases, with an instrument the extreme simplicity and easy construction of which puts it within the reach of all.

2. Imbert and Real. Constriction of the Jaws Following War Wounds. *Presse Medicale*, 1916, also *Ann. di Odont.*, 1916, i, 341.

Constriction seldom or never follows gross traumatisms. It only succeeds small wounds whose healing has been rapid and which have not altered seriously the skeleton of the face. The writers have never seen true ankylosis of the mandibular joint after a wound. Only 10 to 20 per cent of cases of constriction of the jaws are due to cicatrices. Four-fifths of the cases belong to a form quite different and generally easily curable.

Characteristics.—(1) Is produced from the instant the wound is received. (2) Follows an insignificant lesion. (3) The opening of the mouth is easily accomplished. It is brought about by a mouth opener with two divergent branches, opening by bringing the handles together. It is introduced closed between the teeth and opened with a moderate but sustained pressure. During the opening the patient is made to talk, if possible, by asking him questions. The opening ordinarily is not painful. After the first treatment, there are two daily seances of half an hour each with the automatic mouth opener. Between treatments the mouth is kept open with wood blocks between the teeth. A cure is obtained in two or three weeks. The lesion is probably a simple contracture of the muscles of mastication (myotonia).

3. Kreuscher, P. H. Ankylosis of the Jaw; a report of 23 cases from the clinic of the late John B. Murphy. *Interstate, M. J.*, St. Louis, 1916, xxiii, 857.

The four types of jaw ankylosis are:

1. Intra-articular bony ankylosis, true ankylosis.
2. Intra-articular fibrous ankylosis.
3. Subzygomatic cicatricial fixations.
4. Interalveolar buccal fixations.

Murphy's method of treatment is interposition of foreign material to make the joint.

Four cases of ankylosis:

1. Most frequently, extension of suppuration from middle ear.
2. Osteitis or osteomyelitis of mandible extending into glenoid cavity.
3. Metastases from foci of infection in mouth, or elsewhere in body or part of a metastatic arthritis.
4. Transmitted trauma from tip of chin to articulation, giving traumatic fibrous arthritis.

Diagnostic points in osseous or firm fibrous union are:

1. Flattening of jaw on unaffected side.
2. When patient attempts to open mouth the teeth will move from 1-60 to 1-600 inches downward, and deviate a little toward the ankylosed side.
3. Sliding motion on unaffected side can be felt by palpating finger, and muscular activity on that side is much greater.
4. Muscles on ankylosed side are more atrophied than on other side.
5. Distance by measurement from lower edge of zygomatic arch to lowest point on ramus of jaw is less on affected side.

Vertical incision made just in front of ear extending from 1½ inch above zygoma in hair line downward to lower border of zygoma. This incision then curves forward on superior margin of zygoma for about ¾ inch and then curves upward slightly so as to avoid injuring temporal and orbicular branches of facial nerve. This is followed by removal of section of bone ½ inch wide clear across neck of mandible. Great care exercised not to injure internal maxillary artery, which closely hugs neck of mandible. Injury to brain must also be avoided. U-shaped flap of fascia and fat, about 1-inch wide and 2-inches long, with base at upper margin of zygoma, is reflected from over temporal muscle, and packed into bony gap left by bone resection. Flap retained in position by few catgut sutures at its anterior and posterior basal

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angles. Skin wound is accurately closed with horsehair, dusted with bismuth subiodide, and sealed with collodion on gauze or cotton. Wooden wedge is inserted on diseased side to maintain separation of molar teeth to prevent necrosis or compression of flap until it is healed.

Any hemotoma must be aspirated at its first evidence, aspiration being repeated if necessary.

The only failures were reoperated upon with good results. Failures caused, most likely, by not keeping interdental wedge in proper position.

Possibly not all periosteum removed with bone, or the intervening flap may have absorbed.

CARTILAGINOUS AND BONE GRAFTS

1. CAVALIÉ. Treatment of Pseudarthrosis of the Inferior Maxilla. *Bull. et mem. Soc. Med. et chir. de Bordeaux*, 1917, 93-96.

The method consists of an autograft taken from the same region where the graft presents the same biologic qualities as the fractured fragments; the same texture, identical bone and periosteal cells, the same vascular disposition of the capillary vessels in the periosteum, in the compact tissue, and in the spongy tissue.

The principle consists in having a graft long enough for its extremities to be in direct contact with the spongy substance and the periosteum of the two fragments. The junction in particular of the spongy substance of the graft with the spongy substance of each of the two fragments permits very rapidly the vascular anastomoses which prevent necrosis and which precede the work of ossification. It is thus that the maximum chances of success for fusion and consolidation are achieved. It is necessary besides to obtain a consolidation in good position, *i. e.*, the harmonious re-establishment of the inferior arch in relation to the upper arch, which will allow the natural or artificial teeth to occlude normally in mastication.

Details of the method:

1. Opening through the skin at the seat of fracture.

2. Baring of the end of each of the fragments without touching the periosteum, over an extent necessary for removal of grafts.

3. Clearing of the seat of fracture, taking care not to open the buccal cavity, which may provoke suppuration.

4. Freshening with the rongeur the two surfaces of the fracture.

5. Cutting of grafts from one or both external tables of the fragments.

(*a*) If the bony breach is less than 2 or 3 cm., it suffices generally to have only one graft which can be cut long enough from one fragment.

(*b*) If the bony gap is over 2 or 3 cm. wide it may be necessary to cut the graft from each fragment and to unite them in the middle of the breach.

6. Method of cutting the graft.

The graft is detached by cutting with shears the lower bridge of union with the inner table (on the horizontal ramus, for example). Then a flat narrow chisel is passed in the spongy tissue for separation; finally if necessary the extreme limit of the graft on the external table is cut with chisel and mallet.

(*a*) In the process of sliding, it suffices to slide the graft in such a manner that one of its extremities penetrates between the two tables into the spongy tissue of the opposite fragment, whilst its other extremity rests in contact, by its deep spongy surface, with the substance of the fragment of origin. It is at times possible to execute a torsion of this graft on its fragment of origin, leaving it some periosteal adherence in more of the spongy contact.

(*b*) In the process of reversing, the graft is reversed on the fractured end as a hinge, and the spongy substance of the graft is found facing externally. The free end of the graft must enter fully into the spongy tissue of the opposite fragment.

7. Deep reunion by catgut sutures, and cutaneous suture.

A certain number of indications are to be observed:

(i) Operate only in the absence of any inflammatory or pathological condition in the region.

(ii) If a communication with the mouth exists, await healing and removal of alveolar and dental or metallic fragments which hinder it.

(iii) It is indispensable that as perfect immobilization as possible be assured. This immobilization, which is the *sine qua non* of success, should be conceived, and executed minutely by the aid of apparatus which differ according to the position of the fragments.

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In general, it is necessary to previously reduce the fragments into good position and hold them by apparatus, and to soften the neighboring tissues by massage.

A few hours after operation, the immobilization is reinforced by the close union of the inferior maxilla to the superior by wiring together two pieces of apparatus applied to the upper and lower dentures.

2. IMBERT, L., LHEUREUX, C. AND ROUSLACROX. Researches on Heteroplastic Cartilaginous Grafts. *Rev., de chir.*, 1916, li, 111.

Examination, after a long interval, of those operated on showed a tendency to rapid softening of the graft. The graft quickly effected adhesions which enabled it to live; but, as the same time, it gradually became transformed into fibrous tissue. The authors deduce from these experiences, that auto or homo grafts can, equally, in certain circumstances, undergo a more or less complete degeneration.

3. IMBERT, L., and REAL, P. Surgical Treatment of Pseudarthroses of the Inferior Maxillary. *Marseille med.*, 1916, liii, 193-210.

Surgical treatment of pseudarthrosis comprises two principal methods. The first is applicable to fractures with loss of substance equal to two molars (3 cm.) at most—simple *osteosynthesis*. The other can be employed where the breach is greater —*bone grafting*.

TECHNIQUE OF OSTEOSYNTHESIS

Choice of Anesthesia.—The authors prefer general anesthesia with chloroform as having less danger of soiling the operative field with saliva than in the case of ether.

A curved incision is made with concavity upward. For lateral fractures the two ends of the incision are found respectively at the symphysis and at the angle of the jaw. Nearly always this region presents cicatrices to which it is well to pay attention. If the curve of the incision is subtended by a cicatricial line, it is to be expected that the flap will be exposed to sloughing.

The curved incision gives a flap comprising the skin, the subcutaneous cellular tissue and the platysma. In lifting it up, the facial and also a number of small arteries are cut. Traction is made on the flap with a suspensory thread.

The finger exploring the bottom of the wound easily finds the bony extremities. Denudation is aided by means of a bistoury carried as far as the bone, following a line corresponding to its inferior border. Denudation continues with the aid of Faraboeuf's dissector. We commence habitually with the posterior fragment, whose denudation is easy and less exposed to opening the buccal cavity. The dissector works first on the external surface in the direction of the alveolar border and of the ascending ramus. Then it easily exposes the inferior border. The denudation of the extremity is a little more difficult, because of irregularities. Dissection of the deep surface completes the work. All of the posterior extremity is thus well uncovered; one recognizes habitually then that the inferior border has taken a quite oblique direction, often nearly vertical, to such an extent that it is this border that is to be freshened for approximation with the anterior fragment. The dissection of the latter is nearly always appreciably more difficult; that is owing no doubt to its muscular insertions; the dissector follows its contours with difficulty, especially on the external surface and on the end. The internal surface is more easily freed. However this may be, it is necessary that this fragment also should be well liberated. Great care must be taken to keep out of the mouth.

The mass of fibrous tissue between the fragments is now to be excised with scissors, above all the deeper parts. The edges of the fragments are squared and freshened with a bur in the electric engine. See that the fragments come into close contact; if necessary they are brought together by wire passed through holes bored near the ends. A metallic plate is fastened to the ends by screws employed for fixation. It is made of more or less malleable metal (German silver). In putting in the screws, avoid the roots of the teeth. Keep as near as possible to the lower border of the jaw. Two screws for each fragment. Teeth are fixed in occlusion with brass ligatures, maintained for two months at least.

Bone Grafts.—These are only indicated on old cases of pseudarthrosis since the great majority of recent fractures consolidate without difficulty. Aside from cases

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of great loss of substance, the bone grafting operation should always have been preceded by a prolonged prosthetic treatment whose inefficacity shall have been well demonstrated.

4. Morestin, H. Cartilaginous Transplants in Reparative Surgery. *Bull. et mem. de la Soc. de Chir. de Paris*, 1915, xli, 1994.

Cartilages of the 6th, 7th and 8th ribs, are the only ones that can easily be made use of. Resection of any of these cartilages never brings about any untoward consequences, if attention is given, and if one reconstitutes with care, by layers of sutures, the musculo-aponeurotic bed. Even after having entirely removed the three cartilages mentioned, I have never observed any accident or inconvenience whatever, and in particular neither lasting respiratory trouble, nor difficulty on exertion, tendency to hernia, nor pain.

Costal cartilage easily lends itself to be cut with a knife. Sheets, rods, arcs, etc., can be cut, and fashioned in the form for adaptation to their destination with extreme precision. The surgeon has no need, in preparing his piece of prosthesis, either of help or special instruments.

Along with this property of adaptation, cartilage offers very great resistance and will take everywhere the place of bony tissue.

The transplanted fragments are really grafted, they live their normal life, they adapt themselves with extreme rapidity to their new conditions of existence, and this graft succeeds always, so to speak, whilst that of bone is so difficult to obtain. The grafted cartilage lives indefinitely, without being resorbed, without undergoing appreciable diminution. The importance of this may be conceived. The result is that, in practice, one has not to consider reduction in size of the transplanted pieces, and one can and should give them their exact dimensions.

Cartilage may be taken from another person, and may have been removed as long as a month previously to using as a graft. Operations can often be done under local anesthesia. The cartilage frequently remains slightly mobile on the bone, but is adherent to the soft parts. After removing the costal cartilage, it is necessary sometimes to ligate the internal mammary artery. After this, the muscular bed, the superficial aponeurosis and the skin are sutured.

In placing the cartilage, the bony surfaces of the wound must be as free as possible of oozing of blood. The different pieces of cartilage should be applied to one another with flat surfaces. If bleeding persists drainage must be provided for temporarily, by leaving an opening in the skin wound which is usually closed after twenty-four hours. As a rule the cartilage is retained in place by being cut to fit accurately and needs no other retention.

Even infection of the operative field does not necessarily mean elimination of the cartilage, and it suffices to prevent its loss, to reopen the wound, evacuate the pus, and maintain drainage.

The graft does not always suffice to assure definitely the fixity of the jaw. As one cannot unite the cartilaginous tissue to the bony tissue, all that one can hope for is, by the interposition of the transplanted pieces, to fill the interval between the osseous fragments, and to place an obstacle in the way of reproduction of vicious position and very often there exists between the extremities of the bone and the cartilaginous block, a very close pseudarthrosis. In the latter case, the persistence of a slight, obscure mobility does not cause noteworthy interference with the function of the jaw. Improvements in technique will no doubt bring about still better results.

By doing the operation under local anesthesia, the patient can be made to avoid all inopportune motion, the fouling of the wound from emission of saliva.

Above all, the technique can be improved by bringing about better fixation of the parts. The transplants should be adapted in most minute fashion to the loss of substance. They should be made with extensions passing within and without the bony fragments. It would be good practice to fix them with ligatures and sutures.

The jaws should be fixed at the time of and after the operations by means of mechanical appliances and by external apparatus, the latter for at least a few days.

5. Morestin, H. Cartilaginous Transplants in the Repair of Defects of the Lower Jaw. *Bull. et Mem. de la Soc. de Chir. de Paris*, 1915, xli, 2418.

After removal of the graft formed of the 6th and 7th costal cartilages of the *same side*, raised up in a single piece, I stop the general anesthesia completely, and the facial stage in spite of its complexity, is accomplished entirely under local an-

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esthesia with cocain. This method of procedure offers enormous advantages. Most of the dangers of infection are done away with, one is not bothered by the presence of the anesthetist, finally the maneuvers are more conveniently carried out with the patient conscious.

For the operative incision, I am guided by the disposition of scars, and limit myself simply to their excision; the wound which results from their extirpation is enlarged if necessary, its direction is of little importance. I seek then the extremities of the bony fragments, uncover and free them. I measure their distance apart, and then trim the graft, giving it the proper size.

The posterior extremity of the 6th cartilage will become the ascending ramus, that of the 7th will form the angle of the jaw, the two cartilages placed together and fused will constitute the horizontal arch. In order that the angle shall attain the required prominence, and the horizontal arch have a more normal appearance, it is necessary to take the cartilages from the same side as the injured jaw. I take care to trim the anterior part of the graft to a thin bevel at the expense of the internal surface. This thinned extremity must exceed the limit of the breach to be filled, in order that it can be bent back inwardly and applied on the anterior fragment.

To facilitate its incurvation and adaptation, I make several incisions in the piece itself which prolongs the graft, taking care never to interrupt completely the continuity of the perichondrium. Finally, the permanent form can be given to the graft after having installed it in the wound, where its final trimming is done.

METHODS OF FIXING THE CARTILAGINOUS PIECE

At first it is necessary to prepare, between the soft parts and the debris of the jaw, places where the ends of the graft can be lodged. Behind, it is relatively easy; between the masseter, on one side, and on the other the internal pterygoid and what remains of the ascending ramus, a deep excavation is made which will receive the posterior end of the 6th cartilage, to become the new ascending ramus.

In front, it is necessary also to dig out a cavity of reception; the most simple is to turn back the periosteum of the anterior fragment on its external surface, forcing back at the same time all the soft parts.

The end, tapered and prepared as said above, is forced into this lodging. Already the prosthetic piece begins to find a certain fixity. In my last operations I have been solidifying the graft immediately with the surrounding soft parts by suturing them. A strong needle is required to pass without difficulty through the cartilage; the masseter, brought over the external surface of the prosthetic piece, spread and drawn down as much as possible, is fastened to this piece by a series of catgut sutures. The stretched muscle draws the graft upward, and contributes to keeping it very solidly in good position. In all the compass of the piece, above all where one can find a hold on the muscular or fibrous tissue, sutures of catgut are placed. The same is done in front, where the end of the graft is sewn to the soft parts of the region of the chin which are fairly resistant. Thanks to this system of sutures, with multiple threads passed without hesitation in the thickness of the cartilaginous tissue, the piece finds itself fixed in the position desired by the surgeon. Nothing remains but to hermetically close the superficial wound.

It is understood that the operation has been prepared by complete reduction of the vicious attitude of the jaw, that for a long time necessary precautions have been taken to reëstablish the articulation of the teeth on the healthy side if one has not been able to treat the patient shortly after his wound which would have allowed prevention of the displacement.

Apparatus for maintaining immobility of the jaws during and after operation: latch or bolt apparatus.

This consists of two fixed pieces inserted before the operation, cemented one to the upper teeth the other to the lower, on the healthy side, and provided with a bolt to unite them. The fixed pieces are composed of a series of bands embracing the crowns of the teeth, leaving free the occlusal surfaces. Each of the pieces carries on its outer surface a flattened gutter 2 cm long. These gutters are placed to correspond very exactly, that which is attached to the upper piece is placed exactly behind the one on the lower piece; the anterior extremity of the first is in contact with the posterior extremity of the second. They have the same direction, the same axis. The two jaws being brought together, they form a common canal. This canal engages the bolt. The latter is flattened, ending in front in a somewhat larger extremity. It slides with friction in the two grooves which it fills very exactly.

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This system of grooves and bolt is lodged in the buccal vestibule, and the anterior end of the bolt comes opposite the labial commissure.

In spite of its lightness, this apparatus has very great solidity. It is of German silver, and sealed to the teeth with cement. Once the bolt is in place, the two jaws are attached to one another in an absolutely invariable manner. The jaws can be readily opened by withdrawing the bolt, necessary sometimes in accidents in the course of the operation or afterward.

The fixed pieces are cemented before the operation, perfect adaptation between the upper arch and what remains of the lower having been previously obtained, if necessary after section of the callus.

It is necessary that at the time of placing the graft there be no effort made to obtain reduction, nor above all no violent maneuver at the site of fracture, which would lead to communication with the mouth and would render useless the attempt at transplantation.

During the removal of the cartilages, the patient being asleep under chloroform the bolt is withdrawn, the jaws can be opened, the anesthetist is quite at liberty to sponge away mucus, to seize the tongue if necessary. When it comes to the second stage, executed under local anesthesia, the bolt is pushed back and immobility of the jaws is obtained; this state of affairs is left for several weeks.

6. WOODBRIFFE, H. L. W. *Brit. Jour. Surg.*, July, 1917. Reparation of Cranial Defects by Means of Cartilaginous Grafts.

Technique of Cutting Cartilaginous Grafts.—The grafts are taken from the 6th, 7th and 8th costal cartilages, for convenience from the same side as the head wound. The usual incisions are parallel to and a little above the costal margin. A vertical one, two fingers breadths outside the edge of the sternum, however, is preferable. It gives equally good access; can be more easily extended if necessary; hemorrhage is less; the upper fibers of the rectus are split instead of cut. The cartilages having been exposed, shavings are taken of about half their thickness. Care should be taken not to cut through the entire thickness of a fixed cartilage. But the whole tip of a floating one may be taken. It is well to take what seems to be considerably more than enough cartilage to fill the gap. Each graft as cut, is dropped into warm saline solution. To facilitate this work at the bottom of a hole, M. Vilandre has devised an ingenious knife, the blade of which is set on a shank bayonet or trowel wise. This enables the grafts to be cut evenly by keeping the blade of the knife flat.

(To be continued.)

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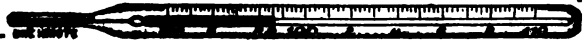

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BOOK REVIEWS

COLLECTED PAPERS OF THE MAYO CLINIC. Vol. viii, 1916, Rochester, Minn. Philadelphia and London: W. B. Saunders Company.

Swift in his essay, "A Tale of a Tub," says, "I have sometimes heard of an Iliad in a nutshell; but it has been my fortune to have much oftener seen a nutshell in an Iliad. There is no doubt that human life has received most wonderful advantages from both, but to which of the two the world is chiefly indebted I shall leave among the curious as a problem worthy of their utmost inquiry." Although it is proposed to leave to the readers of Volume viii, Mayo Clinics, to pick the nutshells from this Iliad of forty-two authors, it must be acknowledged that there are some exceptional nutshells; it must also be acknowledged that in book-making Swift found human nature the same two and one-quarter centuries ago as we do today.

After this digression the writer desires to state that, taken as a whole, more real knowledge of practical value can be gotten out of a comparative study of the Mayo Clinic volumes from year to year in the particular subjects in which they justly are considered authoritative than in any other books with which he is familiar. Since the addition of Rosenow to the Clinic force, a strengthening up of the teachings of science as applied to medicine and surgery is very apparent. The work is more scientific—less technico-statistical. Rosenow's study in "Elective Localization of the Streptococcus" and other organisms is almost epochmaking in its importance, as it is evidently one of the entering wedges in solving the causation, prevention, and successful treatment of probably many diseases, both medical and surgical. A happy clinical demonstration of this has recently been carried out by Rosenow himself, in the successful treatment of little sufferers from endemic anterior poliomyelitis in Davenport, Iowa.

W. J. and C. H. Mayo have papers upon surgery of the large intestine which are instructive, and W. J. Mayo's paper, "The Removal of Stones from the Kidney," is beautifully and accurately illustrated, and, with the text, one who has seen and heard the doctor at this work can almost feel that he is again at the clinic.

Judd describes a way of doing a cholecystectomy which lessens the ever-present danger of wounding the common duct, and Balfour describes his technic of splenectomy, the adoption of which, by all of the operators of the Clinic who do this work, has made possible the remarkable series of splenectomies done at Rochester and allowed of a comparative study of their value in the "Maladies in which Splenectomy May be Indicated."

MacCarthy and Broders call attention to "The Actual Error in the Diagnosis of Mammary Conditions." It will surprise most surgeons to be told and have proven to them how weak they are in differentiating the malignant from the penign tumors of the breast in other than the typically malignant. The authors show that, basing their studies upon an analysis of 1,800 mammary bathological conditions from the comparative standpoint of clinical and pathological diagnosis, there is made, first, an *actual* error of from 2 to 26 per cent;

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second, an *apparent* error of from 8 to 50 per cent; and third, an *avoidable* error of from 1 to 86 per cent. The careful reading of this article will repay any surgeon and it is certainly a "nutshell."

Dr. A. B. Moore has a short but fine paper, "Roentgen Diagnosis of Bronchiectasis," which, independent of several illustrations, X-ray pictures of types of bronchiectasis, has a clear and instructive clinical description of the disease, one of the best we have seen. Following this paper is one on "The Surgery of Bronchiectasis," by Samuel Robinson, a fair, judicious paper, warning against surgery as a panacea in this and other diseases of the chest, and on the other hand calling attention to the ever-positive failure of medical treatment in as many instances. Robinson reports five complete resections of the lower lobe of the lung for bronchiectasis, with one death—20 per cent.

"Tumors of the Spinal Cord, with Report of Eighteen Cases," by the late Dr. Beekman, is the most modest, but withal *the* paper showing the highest individual diagnostic and operative skill of any in the volume. Beekman, with his thoroughness, gentleness and manual skill, was one of the safest operators we have ever seen, and it will be years before the Clinic can train his equal.

Henderson's papers on "Mechanical Derangements of the Knee-joint," and "Loose Bodies in the Knee-joint," are faithful descriptions of these conditions. A number of other good papers might be noted did space permit, but they are mostly upon subjects about which the profession has been well informed in many previous papers from this and other sources.

The final pages of the book on "Technique" and some general subjects, except for articles by C. H. Mayo and Balfour, to which reference has been made, contain nothing worthy of special mention.

JNO. E. SUMMERS.

IMPOTENCE AND STERILITY WITH ALTERATIONS OF THE SEXUAL FUNCTION AND SEX-GLAND IMPLANTATION, by G. Frank Lydston, M.D., D.C.L., Formerly Professor of the Surgical Diseases of the Genito-Urinary Organs and Syphilology in the Medical Department of the State University of Illinois, etc. Chicago: The Riverton Press, 1917. Price, $4.

This unreasonably high-priced book is apparently written by a man with a grievance. The author evidently believes that the medical press has not given him due credit for original work and the book is published in order that his hormone theory of aberrations of sex development and function and his researches and observations in the field of sex-gland implantation may be presented in permanent form.

Nearly half the book is taken up by the chapter on sex-gland implantation. This is interesting reading and shows painstaking research, but the number and results of the experiments do not warrant the sweeping conclusions arrived at by the author. They remind the reviewer of the advertisements of the justly infamous "remedies" sold as cure-alls at the Indian shows so popular a generation ago.

His hormone theory of aberrations of sex development and function would, if proven to be correct, explain much that is now beclouded. However, the theory is still in a nebulous stage.

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His discussion of the diseases of the sex function is clear and practical, but the value of the work as a manual is impaired by the undue prominence given his saddle-galled hobbies. FRANCIS M. MUNSON.

NOTES FOR ARMY MEDICAL OFFICERS. Medical War Manual No. 2. By T. H. Goodwin, Acting Colonel, Army Medical Service. Author of "Notes for Medical Officers on Field Service in India" and "Field Service Notes for R.A.M.C." Introductory note by Surgeon-General W. C. Gorgas, U. S. Army. Philadelphia and New York: Lea and Febiger, 1917. Price, $1.

This valuable little manual is the outcome of a series of lectures delivered by Colonel Goodwin to the classes of the Army Medical School. They are founded upon the experience of this distinguished officer in actual warfare on the Western Front. The solutions of many of the problems confronted by our Medical Corps are found in this book. It will be a valuable assistance to the young medical officers now going abroad for active duty.

The first section deals with the organization and administration of the British Army with special reference to the medical services, duties of the medical officer in charge of a battalion, the regimental aid post, the field ambulance, motor ambulance convoys, casualty clearing stations, stationary and general hospitals.

The second section is a brief résumé of the present status of war surgery. Sir Almroth Wright's and the Carrel-Dakin methods of wound treatment are outlined and the latter very properly approved as the method of choice. Gas poisoning and the principles of its treatment are mentioned.

Military sanitation, including the sanitary organization of units in the field, is well presented in a concise manner.

American medical officers are fortunate in having these timely notes at their disposal. FRANCIS M. MUNSON.

A TREATISE ON REGIONAL SURGERY, by various authors. Edited by John Fairbairn Binnie, A.M., C.M., F.A.C.S. Three volumes with 351 illustrations. Philadelphia: P. Blakiston's Son and Company. Price, $7.00.

This work presents short treatises on the injuries and diseases of the different regions of the body. Volume i deals with the head, branchial system, the thorax and the breast; Volume ii, the abdomen, the genito-urinary system and the spine; Volume iii, in print, the upper extremity and the lower extremity, together with a section on the thoracic walls, lungs and pleurae.

The individual authors were carefully selected. Each treatise is brief, the contents highly practicable and consisting of the opinions of the author himself and not a statement of what "he thought other people would think that he ought to think." The work shows forcibly the particular operations advocated. The respective operative procedures are well illustrated, bringing out clearly the applied surgical anatomy where possible.

The scheme underlying and responsible for the world-wide popularity of Binnie's "Operative Surgery," appearing in a seventh edition in 1916, has been followed in the present work, namely, avoiding the perspective of the usual text-books on general surgery, with sound judgment in selecting and clear statement in describing the operation of choice for the various surgical procedures. H. F. STEIN.

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NOTES AFIELD

OBSERVATIONS OF THE MEDICO-MILITARY ORGANIZATION OF THE ITALIAN ARMIES

By A Military Observer

1. AFTER having presented our credentials to the American Consul at ———, we proceeded to ———, the headquarters of the armies operating at the eastern Italian frontier. There our papers were given the final examination, and each one of us was presented with a document properly signed and stamped, which gave us permission to visit all the Italian frontiers, with especial emphasis laid upon the sanitary organizations. A competent Italian medical officer who spoke English was ordered to escort us on our tour of inspection, and two powerful army automobiles with chauffeurs and mechanicians were given over for our exclusive use during our stay in Italy. The program for each day was laid out the night before by our escort, the medical officer, assisted by other medical officers. The scheme was systematic, thorough and efficient, and no time was lost in executing the plans.

2. In a previous report, dated November 4, 1917, the general scheme of the Military Sanitary Service in Italy has been pointed out, resembling, to a great extent, our own and that of our English and French Allies. It has also been pointed out that they have found it advisable to have a highly specialized hospital service. The Italians probably have carried the idea of specialization in war surgery and war medical service farther than any other nation. The efficiency and economy of such methods cannot be too much emphasized. We found special hospitals for typhoid, for fractures, for brain and nerve surgery, plastic surgery, venereal diseases, etc. Further, the advantages the Italians have in the use of villas, hotels, and private buildings for base hospitals, field hospitals, and even advanced dressing stations were shown.

3. We learned at ——— that the Italians are especially careful on the subject of preventive medicine, and this has brought remarkably good results. Immediately after having been wounded, the Italian soldiers are given anti-tetanus serum, which treatment is repeated within eight days. Dr. Levy, of the British Red Cross service, now stationed in ———, informed us that during one year of service at the Italian front he had not observed a single case of tetanus. Gangrene bacillus infections are of comparatively rare occurrence. It is a rule that every case in the Italian hospitals should have a careful examination of the feces for at least six consecutive days, no matter what the particular

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ailment is, before being sent to the interior uninfected zones. This is for the purpose of determining any possibility of typhoid, cholera, or dysentery, which are the bugbears of the Italian doctors. The typhoid cases, as has already been pointed out, are remarkably few and are cared for in special hospitals. There is a universal prophylactic administration of combined typhoid and paratyphoid vaccine, as well as vaccination against smallpox. In August, 1916, after one of the great battles in the Isonzo Valley, there was a severe outbreak of the cholera, which resulted in as many as a hundred thousand cases. Through an exceedingly careful system of prophylaxis this dreaded disease was confined to the advanced war zone, and not one case ever developed outside that territory. The cholera always originated in the Austrian trenches. At present all soldiers who go into active service at the front receive a cholera prophylactic. This has resulted in a total absence of cholera at the present time.

4. Inquiring into the question of shell shock we learned that this is a comparatively rare thing in Italy. Some of the medical men, especially Dr. Levy, who have observed the medical work at the Western and Italian fronts for long periods of time, seem to think that the extraordinary good health of the Italian soldier and the careful selection of the fighting man have a great deal to do with his superior general health, consequently his more stable nervous system.

5. In ——, we visited a large base hospital with 1,250 beds—the ———— ————. Inquiring into the Dakin-Carrel treatment, we learned that it was not the popular treatment in Italian hospitals. Their method in the treatment of infected wounds was to open wide and drain with dry drains or rubber tubes. There seemed to be fewer cases of infected wounds in Italy than elsewhere. This probably is due to the fighting in the mountainous regions on a comparatively clean soil. They point with pride to their records, which show equally good results to those shown in hospitals where the Dakin-Carrel solution was used. The compound fractures were treated until the infection ceased; the patient was then etherized and the fracture reduced into position and held by simple apparatus for extension. No overhead extensions were employed; a special cardboard was used to make splints, which seemed very practical. The cardboard is cut into proper shape, moistened in water and applied. It would conform very smoothly about the part to be supported, harden within two hours, and seemed to be an excellent splint. There were large, commodious dressing rooms, while the operating rooms were smaller but scrupulously clean.

6. There have been established special hospitals for the treatment of brain, cord, and nerve injuries. One is located in the war zone, one in

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the central part of Italy, and one, which we had the pleasure of visiting, at ——. This hospital was extremely well organized and equipped. It had an electrotherapeutic department, where Faradization was extensively used in the treatment of paralysis. Some especially interesting cases of paralysis of the branches of the brachial plexus were demonstrated and their progress noted. There was an ingenious method employed in the diagnosis and record keeping of these cases by means of specially designed and printed record sheets. These sheets were printed to represent the whole body, or special parts. By means of a color scheme it was recorded what parts were affected—whether the deep or the superficial muscles, the sensory or motor nerves, and the areas involved; also the degree or the intensity of the affection. By a glance at the chart one could tell exactly the condition of the patient at the time of admittance, his progress and condition at the present time, which all saved lengthy descriptions.

A well-equipped radiographic department was installed, and we had the pleasure of observing some good work in radiography. There was especially an apparatus known as "Radiostereometre Baese," used for locating foreign bodies. The examination was quickly made by aid of a fluoroscope, by simple measuring methods and pointers. Without any compasses and with but little calculation a foreign body could be located in a short period of time. The surgical work performed in this hospital was very good. We had the good fortune of witnessing some cranio-plastic work by Professor Righetti, when he performed his specially modified flap operation. As a general rule the brain decompression was performed after twenty days and the cranio-plastic work done at any convenient time following, when the patient was out of danger. The cases demonstrated showed excellent results. We also had the privilege of witnessing some nerve surgery.

7. At —— we visited another special hospital, for oral surgery—the ——— ———, where Prof. Perno Amedero is the surgeon in charge. His work and his hospital organization were both very good. At the time of our visit there were 150 cases in the hospital, every one a mouth or jaw case. There was a large dental workshop in connection with the hospital, where a number of dentists and their assistants were at work. Plaster models were demonstrated, as well as photographs showing a complete record of each case from the time of entrance to the hospital, the steps of the operations, and final results. The X-ray work was good, and here as in many other hospitals the direct method was used; that is, the exposure was made directly on paper instead of plates, which was then developed, appearing as an ordinary photograph taken from a plate. Since the beginning of the Italian campaign 4,000 cases had been

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treated here. A number of cases were demonstrated, and we were especially impressed by the fact that none of them had any escape of saliva from the mouth, a very common feature noticed elsewhere following oral surgery. The success in the restoration of badly mutilated faces seemed truly remarkable.

8. A visit was made to Ospodale ——— ———, located to the east of ——— in the war zone. This was the largest base hospital we visited, having accommodations for 4,000 patients. The hospital buildings had in former times been a cavalry school, but now were nicely adapted to their new purpose. The buildings covered a very extensive area with a large open space in the center, which had formerly been used for cavalry practice. This was now transformed into a vegetable garden, cared for by convalescent patients. The garden products were largely used by the hospital kitchen. So well trimmed was the garden that the work was evidently supervised by an expert gardener. It is not without interest to note that the Italian government encouraged this form of gardening in connection with every hospital, the economy of which in a country at war must be self-evident. As a result we saw very good looking and productive gardens, and even poultry yards, in connection with every large base hospital. The food quality was remarkably good at all these hospitals.

The hospital was beautifully organized with large, modern and well-equipped laboratories, X-ray department, sterilizing department for patient's clothing, and a special one for re-sterilization and re-preparation of recovered bandages and surgical dressings. The wards were well lighted and scrupulously clean. It was compulsory for each patient when visiting a wash room or toilet to slip on a pair of wooden shoes which were lined up at the entrance to each such station. While a simple practice, this facility for promoting cleanliness must be a great factor in preventing the spread of infection, dirt and moisture throughout the hospital.

In connection with the hospital were several temporary barracks of the chalk-walled variety, which have already been alluded to in the previous report. They were built out of double-plastered walls, were white finished and very attractive one-story structures, measuring 200 by 7 meters. Each barrack included a modern bathroom, two water-closets, pharmacy, and dressing room. The capacity of each was 150 beds, and the cost of construction, $1,800.

The kitchen was large and clean, provided with modern cooking apparatus. A particularly noticeable feature in the food supply room was a special brand of preserved (not condensed) milk. This milk was sterilized and put up in cans and, because of hermetical sealing, would

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last for many years. We had the pleasure of tasting it and found it very palatable and free, as claimed, from chemical preservatives. It was a product of Milan, and its value and convenience in a hospital diet cannot be doubted.

This was particularly a surgical hospital, although in times of offensives it would become more of a general type. The operating rooms were well lighted, clean and orderly, and the work performed was of a high class. It was interesting to hear that artificial pneumothorax was much employed here in the early treatment of lung injuries.

9. That the physician's work is not limited to the preventive and curative treatments only was proved by our visit to a salvage plant near ———. This was under the direct supervision of a physician and was one of the several (each army has a salvage plant) in Italy. The work performed was of a wide scope. All sorts of materials used by an army in the field—helmets, stoves, knives, bayonets, guns, tents, blankets, clothing—were found here. This material had all been picked up on the battlefield and brought here for thorough rejuvenation. The greatest care was used in handling the material, a large percentage of which, no doubt, was infected by the germs of deadly diseases. The systematic disinfection, washing, cleaning and repairing were admirably performed. We were shown large stores of reclaimed material which, we were told, saved the government close to $1,000,000 per month. Two-thirds of the number of workers here were women.

10. We visited a clearing station at the terminus of a railway system operating as close as 6 kilometers from the front. After an engagement, sometimes within a very few hours, great numbers of patients are brought here by automobile ambulances. They are then classified and disposed of to the different field hospitals, 15 of which are connected in their work with this clearing station. As many as 6,000 patients could be received and distributed from this institution within twenty-four hours.

11. *Hospital Trains.*—At the outbreak of the war the Italian government had no hospital trains. The Italian Red Cross has 22, and the Malta Cross 4. The government has since constructed 46, making a total of 72 hospital trains now at the disposition of the Italian Sanitary Service. We visited two such trains—one of the Malta Cross and one of the regular army, which are built on the same plan. Each had a capacity of transporting 300 to 350 sick and wounded. The stretchers, which also formed the beds, were well constructed and strong. They were placed in tiers of three, parallel to the car side, leaving a wide passageway through the center of the car. The sickest or most gravely wounded were placed on the lower shelves.

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12. An interesting feature in connection with the stretchers was their uniformity of construction. Because of standard size the stretcher on which the wounded or sick soldier was placed on the battlefield accompanied him to the ambulance, to the temporary dressing station, and to the train without necessitating his being moved from his original rest.

13. It is interesting to note that much first-class surgery was performed right in the field hospitals. The following is a report on the surgical service of field hospital No. 83, by the major in charge, from August 16 to September 20, 1917, which I have had translated from the Italian language.

Patients admitted, 893, and classified as follows:

Cranial	68	Abdomen	25
Face	39	Upper extremities	138
Neck	16	Lower extremities	375
Thorax	110	Miscellaneous (slightly wounded)	8
Spine	9		—
Shoulders	105	Total	893

Of this total, 685 were transferred to other hospitals, 20 were returned to duty, and 31 died. According to the figures the percentage of mortality was 3.45 per cent. On September 20, 1917, there were 164 wound cases in the hospital.

Of the 68 cranial cases, 52 were operated upon. Sixteen were not operated upon because the lesions were only superficial. Of the 52 cases operated upon, 48 recovered completely and 4 died. Of the 110 thoracic wound cases 5 died, 3 of these following pneumonia, 1 acute anemia and 1 acute anemia and shock. In general the thoracic cases were treated by absolute rest for twenty days, except in cases where special therapi was indicated.

Of the 25 abdominal cases, 18 were treated by rest, diet, morphine or stimulants. Six were operated upon. Eleven of the 25 died, 5 of the number following the operations.

Of the 513 wounded in the upper and lower extremities, 5 died, one of these following acute anemia, 4 after sepsis. These latter 4 were not operated upon because of general bad condition.

All simple fracture cases were transferred to other hospitals. The compound fractures were treated in the hospital by opening and draining, heliotherapy and immobilization. Joint wounds were very few and not serious.

Where indicated radiograms were taken—from August 16 to September 20—80 in all were made.

The treatment of wounds in general was very simple, generally by

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opening the destroyed parts and wound edges, excising them and draining with sterile gauze. The wounds were never washed, merely mopped out with dry sponges or gauze. Very often "Vincent's Powder" was employed (boric acid 9 parts, calcium hypochlorite 1 part). The result was very satisfactory. Very rarely, when indicated, the wounds were washed out with peroxide of hydrogen. In nearly all wounds heliotherapy was employed with good success. Antitetanic serum was given in all cases of wounds.

Of the total 895 cases, 95 were operated upon, according to the following division:

Cranial	52	Abdominal	6
Face	1	Upper extremities	6
Neck	3	Lower extremities	19
Thorax	3		—
Shoulders	5	Total	95

Twelve died following the operation, as follows:

Cranial	5	Lower extremities	1
Neck	1		—
Abdominal	5	Total	12

The figures show that the rate of mortality in operative cases was 12.0 per cent.

In all urgent cases operations were performed immediately upon admission or during the same day, with exceptions where such contraindications existed as shock, acute anemia, general peritonitis, or sepsis in advanced form. The wounds were sterilized with pure tincture of iodine. The operator's and the assistants' hands were sterilized by a wash in pure alcohol, plus 2 per cent iodine, for five minutes. The gauze and dressings were sterilized in an autoclave. Only sterile gauze was used, very rarely iodoform gauze.

For anesthesia there were employed morphine and chloroform. In one-third of the number of operations local anesthesia, such as infiltration of stovanin, or freezing by ethyl chloride, was employed. In abdominal and cranial cases general anesthesia was always employed. In the other cases the nature of the operation and the condition of the patient were the governing factors.

Concerning the cranial cases: As a general rule they were all operated upon, except where the surgeon was reasonably sure that the wounds were only superficial. Repeatedly it was found that with very light and seemingly superficial lesions of the scalp there existed underneath large lesions of the skull and the brain. In but six of the 52 cranial cases operated upon were there no deeper lesions. As a general rule the cranial wounds were recent, but there were a few which were several

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days to a week old. Radiography was performed before operation in all cranial cases.

In general craniotomies were performed with hammer and chisel. In cases of simple penetration of pieces of bone into the brain, extraction was performed. In cases of large depressions trephining was performed by raising the depressed part; this was also for the purpose of digital explorations and for the purpose of stopping hemorrhage. Through the opening, following trephining, one could make valuable digital explorations and digital extractions of bone particles which could be done by no other means. Projectiles and bullets were always extracted from the brain wherever possible. Only in four cases were found grave lesions of the longitudinal and lateral sinuses. Such wounds were always produced by bone fragments, and when attempts were made to extract these, severe hemorrhages were always observed. When the wounds of the sinuses did not exceed one-half centimeter in size, haemostasis was made by suturing, the Carrel technique being employed, that is, the fine needle and very fine silk. The results of such suturing were always satisfactory. When the surgeon was sure of no infection the wounds were closed and usually healed by first intention. In other cases the wounds were left open with a drain of gauze.

In one-third of the number of cases of cranial injuries, paralysis in some form was present and usually disappeared after the operation. In but few cases there remained the paralysis of the facial nerve, and sometimes strabismus. The results of these operations were very satisfactory, in all but five cases, the patients dying of infection following cephalitis or meningo-cephalitis. In 5 of the 52 cases Jacksonian epilepsy developed some days after the operation. The symptoms disappeared spontaneously or following the administration of bromides. Percentage of mortality following cranial operations, 9.6 per cent.

In the three neck cases there was one with a projectile beneath the pneumogastric nerve, producing symptoms of dyspnea and dysphagia. He recovered from the symptoms following the extraction, but later developed a broncho-pneumonia, from which he also recovered. The second case was one of gas gangrene of the neck muscles. The treatment consisted in dissection and complete separation of all deep, as well as superficial, neck muscles on the right side. The patient got well. The third case had a ligation of the carotid artery performed for the purpose of stopping a severe hemorrhage from the lingual artery. The operation was made rapidly and the hemorrhage stopped; the patient, however, remained in a very bad state of acute anemia. He was given 1,500 cc. of normal saline by the intravenous method, which brought back his pulse. He died, however, in half an hour following the injection, with symptoms of dyspnea and cyanosis, because of the high dilution of the

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blood. Percentage of mortality from neck wounds, 33⅓ per cent.

The thorax wounds did not present any special interest. Some rib resections were made and all cases got well.

Abdominal: Six operations performed, of which five were laparotomies and one suprapubic cystotomy. All these patients were in very bad condition. One had a projectile in the pelvis of the left kidney. He got well very rapidly. Three died of general peritonitis, one of acute anemia, following a severe wound of the spleen. This latter case died of acute anemia. One case operated upon for multiple perforation of the small intestine died in four days of myocarditis. The suprapubic case, also having had severe pelvic injuries, died of sepsis. Mortality rate high: 83 per cent.

There were 25 operations performed on extremities, mostly dissections for gas gangrene. All got well. Four amputations were performed for gangrene following very grave wounds of compound fractures and arterial and venous lesions. All recovered. Note very low number of amputations, considering 513 cases of wounds on the extremities. Percentage of amputations, 0.77 per cent.

Seven operations were performed on blood vessels, one on the axillary artery, one on the femoral artery at the origin of the deep femoral, three wounds of the arteries and femoral veins in the region of the tibial and fibular vessels. In all these, ligation of the vessels was performed. Suturing could not be performed because of severe lacerations and contusions, or because of the general condition not permitting long operations. In five cases there were light wounds of the arteries and veins.

14. Near —— we visited a venereal and syphilitic hospital with about 400 beds. The treatment presented nothing of special interest. We merely wish to acknowledge, again, our satisfaction with the specialization of hospital service.

15. Not far from —— we visited an interesting and highly instructive museum which is devoted entirely to an exhibition of specimens of war pathology. The collections were housed in a very modest wooden building, the collecting, preparation and classification of specimens being under the direct supervision of Col. Guinia Salvi of the Italian Red Cross. Here we saw a remarkable collection of skulls, demonstrating all forms of fractures and destruction. They were mounted in such a way as to show as nearly as possible the mechanism of the injuries. In the same way was demonstrated every bone of the skeleton. The skill with which the fragments in severe comminutive fractures were wired together deserves great praise. There was also a complete collection of all internal organs, with a clear demonstration of their respective injuries.

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INSTRUMENTS AND APPLIANCES

AN IMPROVISED APPARATUS FOR THE PERIODICAL FLUSHING OF WOUNDS WITH A MEASURED QUANTITY OF SOLUTION.[1]

Major Howard Lilienthal, M. R. C., Base Hospital No. 3, has recently devised an automatic appliance for the irrigation of wounds after the Carrel-Dakin method, which he kindly describes for our members, as follows:

Conscientious regularity and care in the flushing of wounds which are under treatment by the Carrel method is absolutely essential to success. By night, as well as by day, every two hours, a measured quantity of the Dakin's fluid must moisten the infected surfaces.

It occurred to the writer that much responsibility might be taken from the nurse if a simple and inexpensive method could be devised which would automatically flush the wound at desired intervals with a uniform and easily determined quantity of solution. Accordingly, after some experimentation, the apparatus indicated in the accompanying diagrammatic drawing was perfected. In practice the little device has given great satisfaction.

A represents a one-ounce (more or less) glass syringe which can be purchased for a few cents. There should be two of these and they are used without the pistons. *B* is the irrigator which forms the reservoir for the Dakin's solution. *DD* is a red rubber tube attached to the outlet of *B* and passing through the screw clamp *C*, as shown in the picture. At the lower end of *D* there is a medicine dropper *L*, the lower end of which should be large enough to cause the formation of a large drop of solution when the clamp *C* is properly set. This medicine dropper passes through a cork, which, in addition to the central orifice, to permit the passage of the medicine dropper, has a small airhole perforation. *F* represents one of the syringes. *G* is a red rubber tube about the size of a 15 French catheter, but the exact size is not important. It is formed into a syphon and at the termination of its long arm there is a glass tube *M* of uniform caliber, not pointed at the end. This glass tube passes through a perforation in a cork and in this cork there is also another small perforation as an air vent. The cork is fitted into a second glass syringe *I*, and to the nozzle of this second syringe the red rubber Carrel tube of proper caliber is fitted. This red rubber tube passes to the wound where the Carrel glass terminal *K* is fitted into it and from *K* the tubes pass in the well-known manner to the infected surfaces which are to be treated. The bottle *B* is on a stand beside the patient's bed. The remainder of the apparatus, down to the syringe *I*, is fixed to a board, either with wire, cord or even adhesive plaster.

[1] This apparatus, made specially with a glass syphon instead of the rubber tubing, was demonstrated before the New York Surgical Society at its regular meeting on December 12, 1917. The use of the syphon in apparatus for emptying hollow viscera is not new. Indeed, Capt. A. J. Bendick, M. R. C., applied this principle some years ago in a device for keeping the bladder empty after suprapubic cystotomy.

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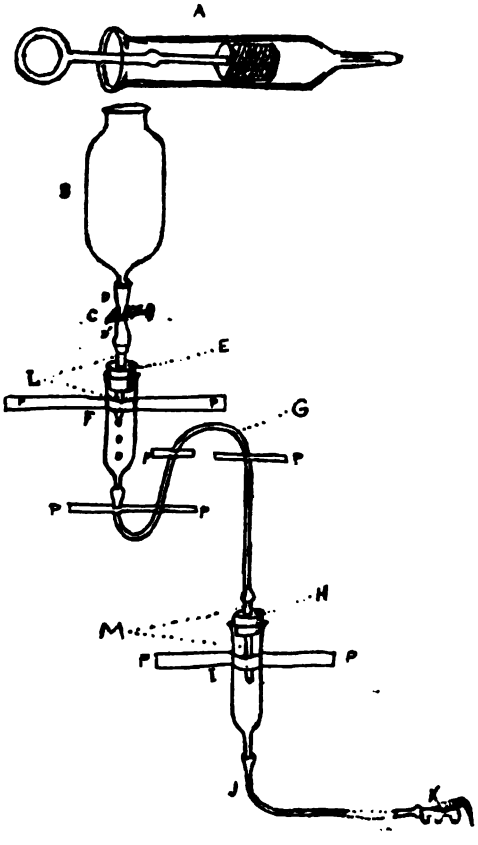
The latter, indeed, is the simplest thing to use. It is shown in the diagram by *P*, *P*.

Operation.—The highest point of the syphon *G* will determine the amount of liquid which will be emitted at each flushing. The higher the curve of the syphon the greater will be the quantity of fluid at each emptying. The clamp *C* is screwed down just tight enough to permit a drop to fall from the point of the medicine dropper *L* every fifty or sixty seconds. One drop a minute means 120 drops in two hours. The syringe *F* gradually fills until the highest level of *G* is reached, after which the next drop or two will cause an immediate emptying of *F* by syphoning into *I*, from which it quickly drains off to the wound. The syringe *I* is necessary because, were the tube *G* to be continued down to the wound, the apparatus would become air bound and would work irregularly. The entire apparatus is easily sterilizable and, when once set, is sufficiently accurate for all practical purposes.



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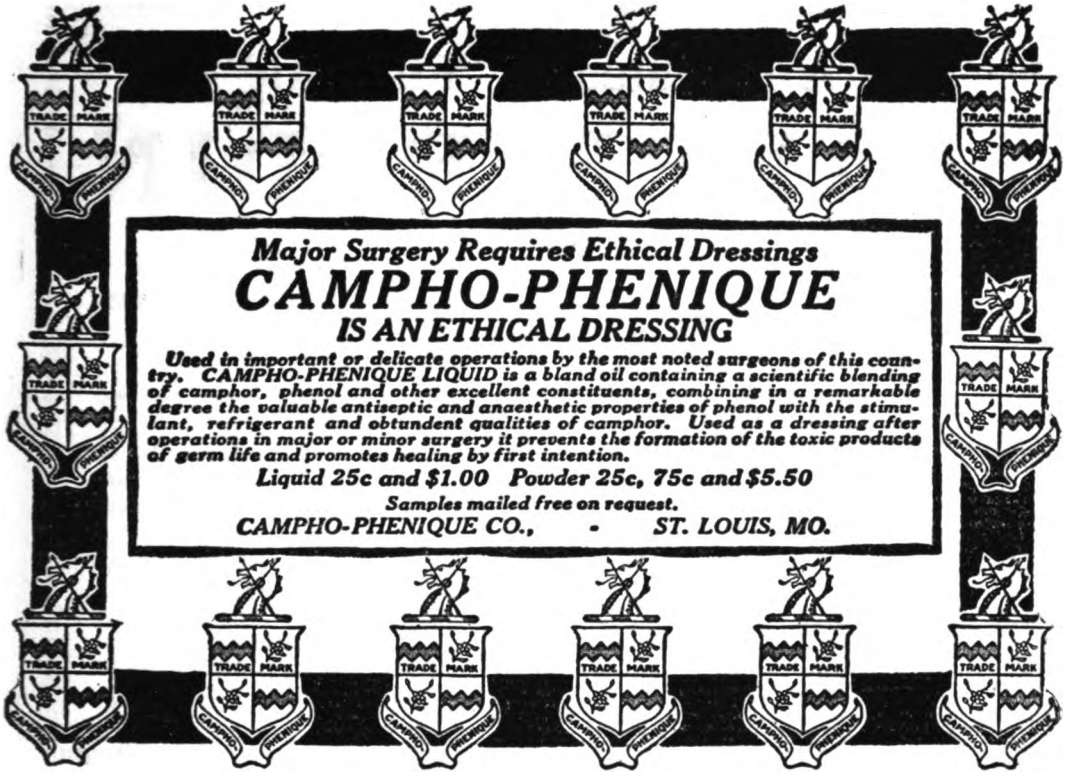
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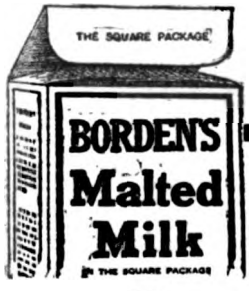

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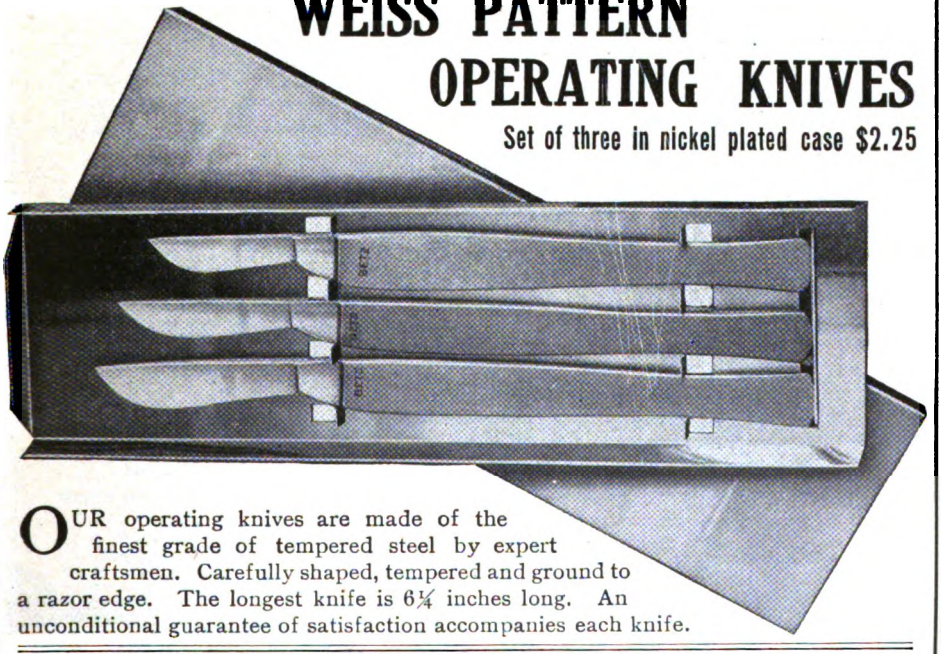

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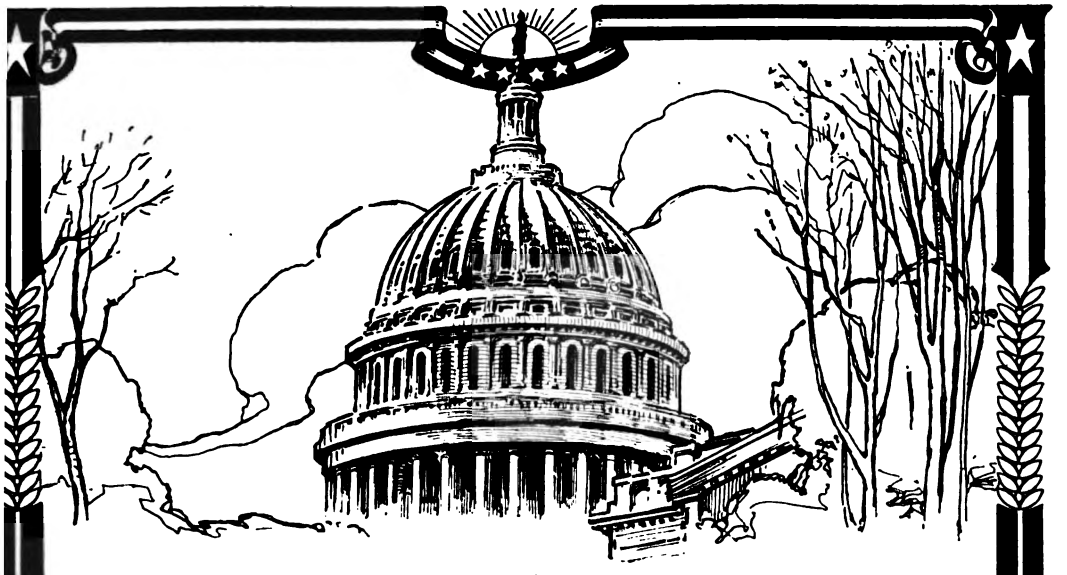

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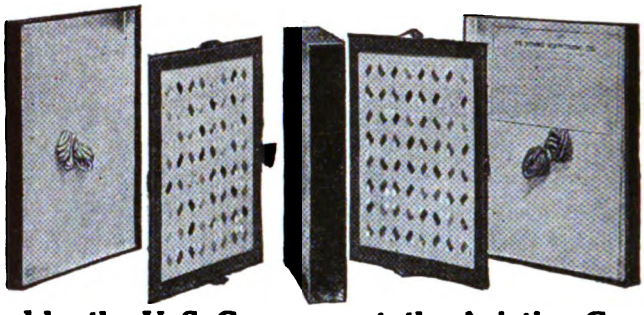

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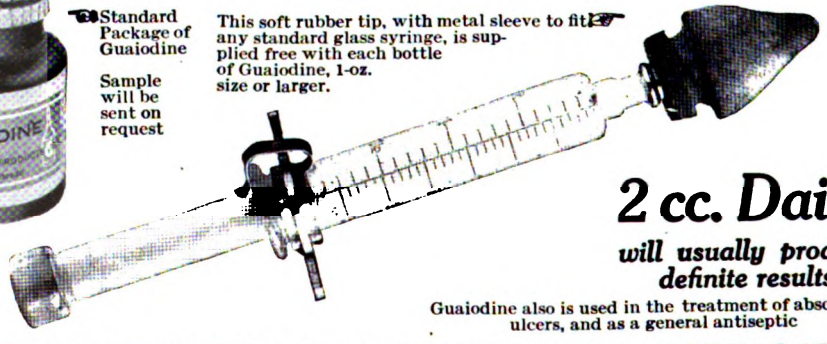

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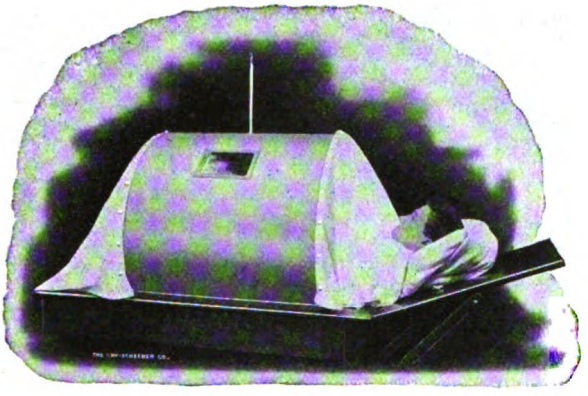

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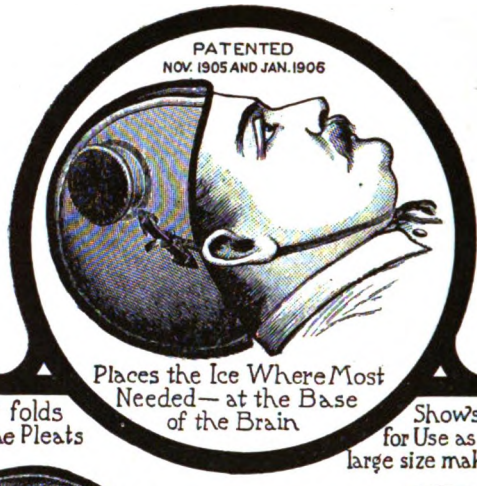

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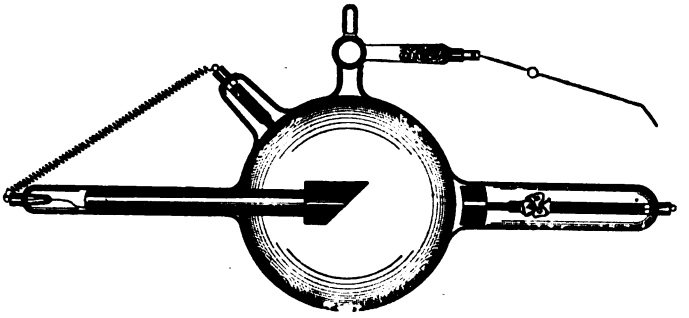

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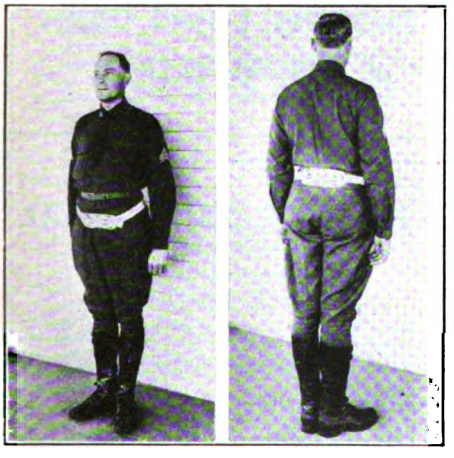

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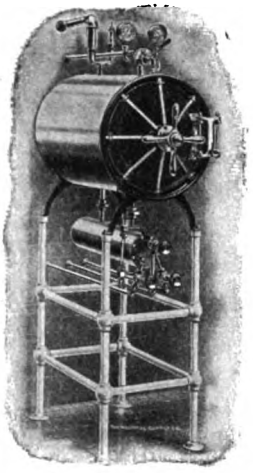

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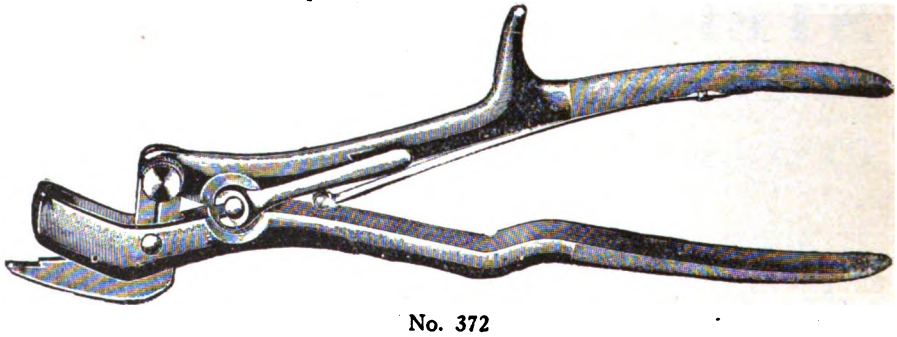

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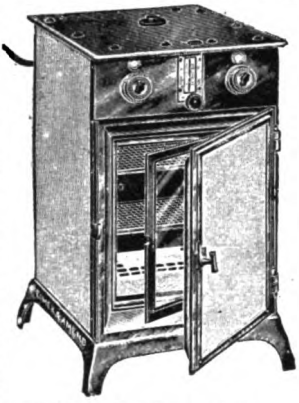

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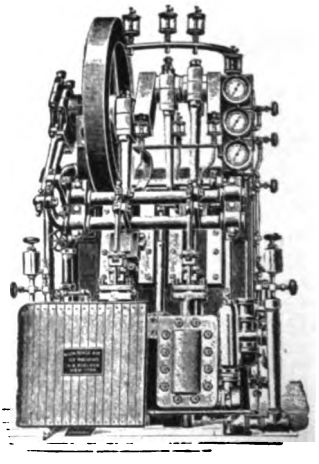

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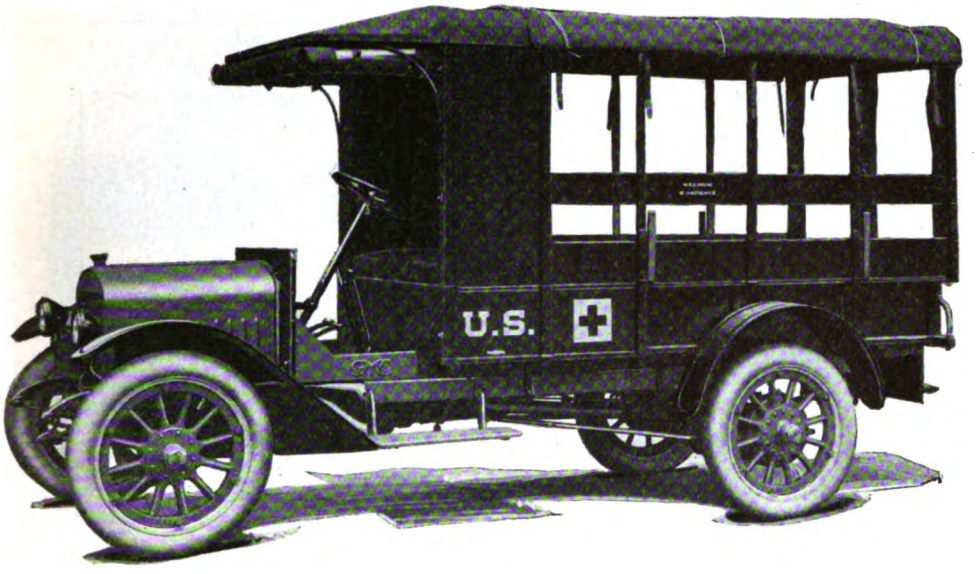

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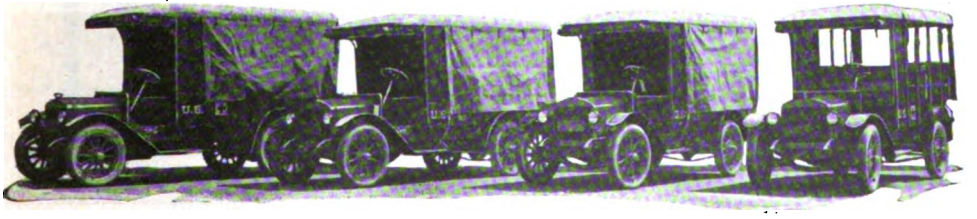

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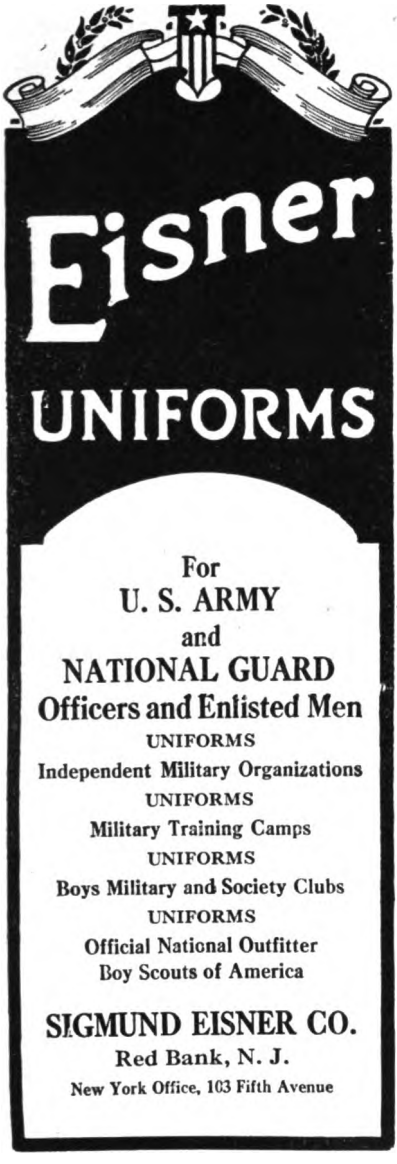

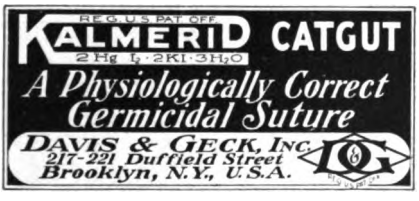

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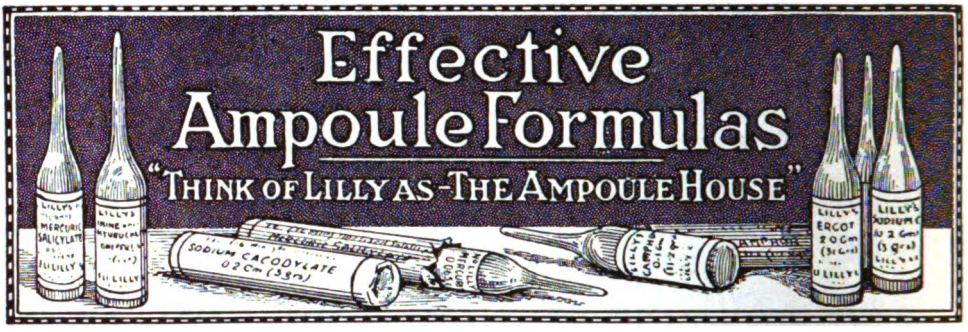

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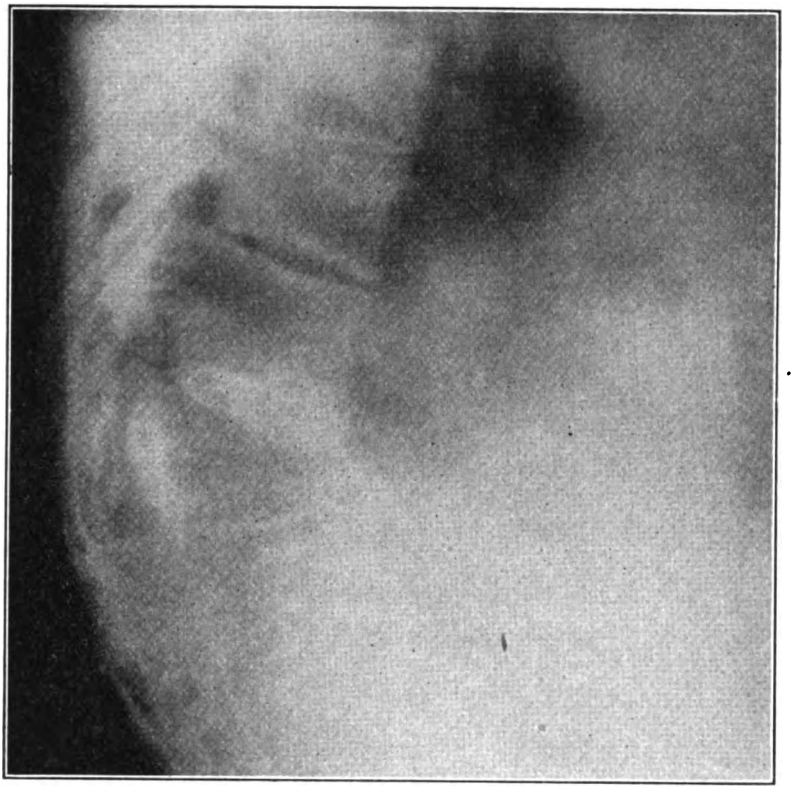

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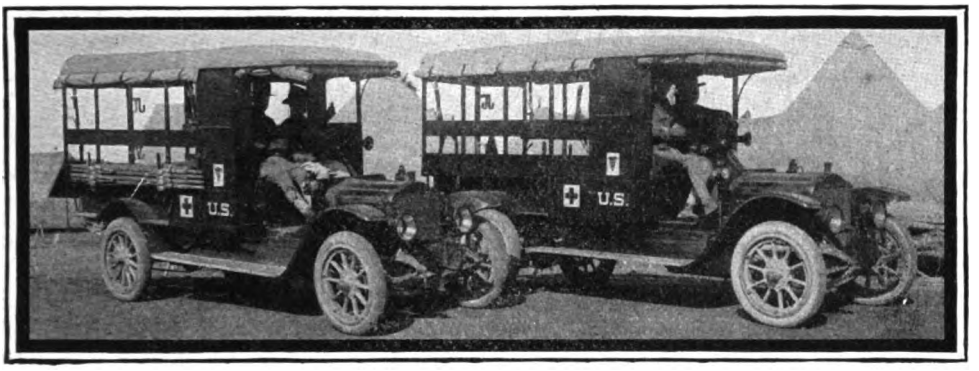

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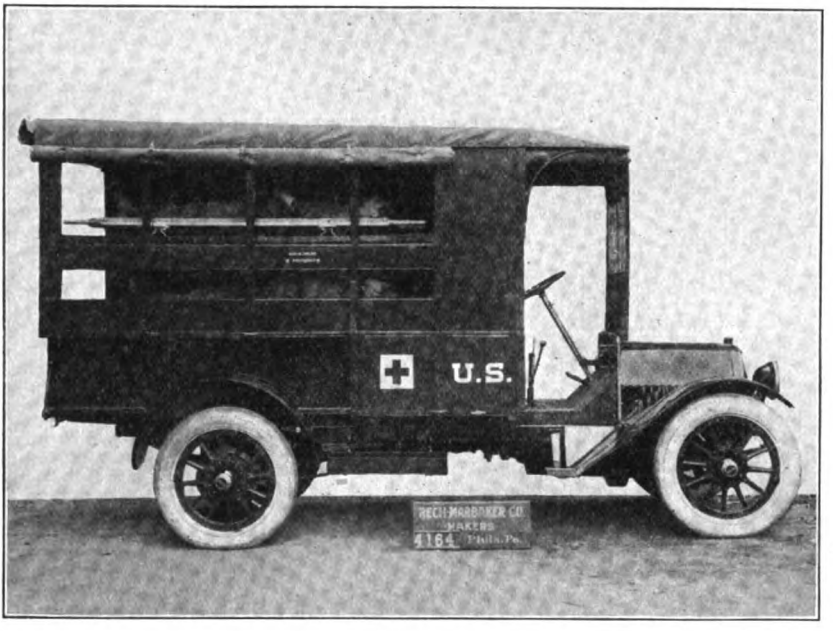

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ORIGINAL ARTICLES

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MALINGERING IN U. S. TROOPS, HOME FORCES, 1917[1]

THE OFFICE OF THE SURGEON GENERAL, U. S. ARMY

THOSE who allege, counterfeit, exaggerate, create or conceal disease in a military environment can be divided roughly into two groups: One containing those who do so with full knowledge, intent and responsibility; and a second group of which the members are hypochondriacs or constitutionally inferior individuals who, throughout their lives, have never been able to meet disagreeable situations without complaint and ruse, deceit and evasion. The first group, in the present mobilization at least, is small. Few cases have been brought to court-martial, and the consensus of opinion has been that most of the malingerers had something the matter with them. For example, the medical service at Camp Hancock reports that "viewed from all angles no patients could be accused of a deliberate attempt to deceive."

The second group contains the large numbers. One surgeon expresses himself as convinced "that in almost all of the cases in which defects were simulated or exaggerated, the patients were actually defective either in a lesser degree or in a different affection or in both. Whether the malingering took the form of mental or nervous or physical defects it was based, in almost every instance, on an actual unstable or defective mental state."

The progress of medicine has altered the military aspect of malingering. It has rendered the act itself much more difficult of accomplishment and in this way has decreased the numbers in group one. Group two, on the other hand, has been enlarged, as the increase in number and accuracy of diagnostic methods, and the clinical recognition of glandular disorders, bone diseases, psychopathic states, etc., formerly unrecognized, has resulted in soldiers now being sent to the hospital who twenty-five years ago would have been sent to the guard house.

[1] Bulletin compiled from the reports of medical officers, by Maj. Pearce Bailey, M.R.C., U. S. Army.

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To-day the medical officer's chief duty in reference to malingering is to determine the degree of inferiority which underlies it, and to frame recommendations so as to ascertain whether the malingerer, with his particular defects, is of the stuff of which a soldier can be made. Whenever the question is doubtful, he should hesitate in recommending discharge, because the administrative management of malingering, as will be made apparent in succeeding paragraphs, requires that as few discharges as possible be granted.

Frequency.—The diagnosis of malingering, in general, remains a matter of medical opinion. It is unusual for it to be entered on records as attempted fraud. Considered as an offense for which conviction could be obtained at court-martial, it has always been exceedingly rare. It is not mentioned by name in the Articles of War, Army Regulations, or Manual of Court-martial. In the German Army, for the period of 1894–1908, there were 43 cases. In the French Army, during a period of 37 years, there were 308 cases. The records of the present inquiry show only one case in which a verdict of guilty was found at court-martial. Malingering in general has also been reported as infrequent. The surgeons of several National Army divisions have reported it as not troublesome, and surgeons of several National Guard divisions have reported no cases at all. It is naturally most frequent at the National Army camps, but even here it probably has never reached a figure in excess of 1 per cent of the whole command, a few hundred cases of all kinds. This percentage and these numbers may have to be increased when the men of the first draft are reexamined, as it seems probable that some did feign disease successfully at the draft boards.

In the camps, the diagnosis of some simple malady is usually entered on the records and the man returned to duty. In most cases there is doubt enough as to absolute fraudulent intent to make this unavoidable. Sickness is more popular in the army than elsewhere, if only for the reason that it means stopping work and costs nothing. One surgeon makes the following remarks in this regard: "Of those coming to sick call and dispensary, 10 per cent are pure malingering, 40 per cent exaggerate symptoms, which would not be sufficient to cause a cessation of work in civil life, 40 per cent somewhat sick and would stop work in civil life, but would not send for a doctor, 10 per cent quite in need of attention and in civil life would stop work and procure medical attendance."

General Causes.—The more clearly the examiner has in mind the personality traits and the actual causes and conditions underlying the pretensions of the more or less defective persons who feign or exaggerate symptoms in order to evade their duties to their country as soldiers, the

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more easily will he be able to establish the presumption that a self-alleged sick man is playing a part.

The present mobilization has shown that the foreign born resort to this form of deception more than the native American, and those from the central and eastern portions of Europe more than those from the western section. The reason of this is that many of them are Jews, a race that has always been averse to belligerency. As estimated ratio of malingerers among our troops has been given as:

Jews, foreign	5
Jews, native	3
Other foreigners (notably Italians)	2
Americans	1

Little malingering to escape *service* is reported among the northern negroes; what there is among negroes from the south is said to disappear as soon as they are given their uniforms. After that they malinger to evade *duty*.

Generally speaking, there are two main types of malingerers: country and city. Those of the country type are foolish and clumsy in their attempts, often grotesque, come to camp provided with recently purchased apparatus such as green spectacles, trusses, or with allegations that varicoceles, hydroceles and the like are ruptures, complain of pains in the back, kidney disease and similar ailments in a foolish, unconvincing way.

City malingerers are much more astute. They are generally familiar with the jargon of the metropolitan clinics and are apt to make their complaints less specific.

Of the underlying causes, fear and timidity are unquestionably the most frequent and conspicuous and probably underlie all the others. But fear and timidity may exist as constitutional qualities and may have determined the mental attitude or choice of career in persons who are not cowards superficially, or who even may be capable of acts of physical courage. They may have become established traits of character, inconspicuous or even reputable in peace, though springing from fear; and would not have involved imputations of cowardice against those who possessed them except for the exactions of war. Chief among the representatives of this class are the conscientious objectors (who cannot be regarded as malingerers) who, years ago, individually or as members of religious sects, interpreted the Scriptures as making no distinction between warfare and murder, and who made up their minds to take no part in either.

Motives of personal advantage, especially mercenary, can often be

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established as the basis of unwillingness to serve. A number of malingerers who had claims pending for injuries received in civil life are reported. Men hate to give up good jobs or to lose chances to make money. Then many are really interested and contented with what they are doing and are resentful at suddenly being called upon to throw it all over for something in which they discern no personal advantage. Farmers are frequently quoted as saying that this is not their war, that Germany is a long way off, and that they could be of more use to the country, anyhow, if permitted to go on with production in their own peaceful way. In Quebec, love of farming outweighed patriotism among the French. It appears from the Provost Marshal General's report on the operation of the selective service draft law that twelve in every hundred drafted agricultural registrants filed claims, while but two in every hundred drafted non-agricultural registrants filed claims.

The lack of national feeling makes it easier for such motives as personal comfort, family reasons and laziness to prompt men to malingering to avoid what they feel to be of no personal interest. Given lack of patriotism, it would be easy to construct a satisfactory moral defense for almost any deceit in evading military service.

One surgeon reports:

> There were many instances where men asserted that exemption was necessary in order to render financial support to their families, although the present rate of Army pay was equal to and sometimes exceeded their financial income in civil life. When the discrepancy was called to their attention, there would be substituted some existing physical impairement, or history of injury or illness in earlier years which would be given as an excuse for inability to drill or perform other military duties.
>
> Draft men on occasions would report on sick call or approach the surgeon at odd times in the organization area, requesting consideration for exemption on account of alleged physical impairment of some member of his family. In several instances, questioning failed to substantiate the reasons given, which resulted in the man resuming duty and satisfactorily discharging the routine thereof.

Men who try to evade military service for family reasons of this kind usually approach the matter of disqualification more frankly and intelligently than the ordinary slothful malingerer, seeking release through the legitimate procedures prescribed by the Federal Government.

Gross ignorance is responsible for much malingering. This ignorance proceeds, not from illiteracy, but from an almost unbelievable lack of information concerning the simplest conditions of life. Many of the miners, mountaineers and farmers of the southwestern and southern states are reported as not knowing why or whom we are fighting, not

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even knowing that a war is going on. Under such circumstances, they easily get the idea that the Army is some kind of a punitive institution and naturally enough try such simple measures as their primitive minds are able to compass, to get out of it.

It is probable that there would be even less of malingering in our troops did not service imply fighting outside the confines of the United States. A considerable proportion of drafted men are of German or Austrian birth and ancestry. Some of them state that they have relatives in the armies of the Central Powers and that, while they are willing to fight in case of invasion, they are not willing to fight abroad.

But the largest numbers of malingerers are found among those who take the same attitude toward military service which they have always taken toward everything in life requiring orderliness, obedience, industry, and unselfishness. Their essential timidity has shown itself in evasion, which has become a habit with them, and they have indulged in it in the past by truancy, by running away from home, or later by throwing up jobs, when conditions became disagreeable, by vagrancy, by illness as an ever-ready excuse for not doing their duty in the world. Military service brings them to light, but the Draft Law has made no fundamental change in their characters or in their behavior.

An idea of the general causes, as observed in a group, is given by the following classification of 126 malingerers observed at Camp Hancock. With the exception of twenty-one of them, they seem of obviously questionable mentality.

Those who feign or exaggerate sickness to get out of work	25
Professional shirkers	15
Those slow to comprehend	9
Those to whom all duties seem hard and have an idea they are imposed on and are never satisfied	14
Neurasthenics	16
Continual offenders	9
Lack of adaptibility to soldier life	10
Religious fanatics	5
Those who are unable to keep clean	10
Those who are always complaining of an old injury to avoid work and which upon examination shows no evidence to corroborate the complaint	6
Those who try to have assignments changed claiming present assignment is too difficult	10

Motives.—The following motives, in relation to the military situation, are demonstrable:

1. *To Evade Service.*—This is by far the most common purpose behind all malingering in our troops and is most frequently encountered among

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drafted men. In all other branches of the service, to malinger necessitates the reversal of a choice already made and is consequently much less frequent than in drafted men, who have had no choice in the matter. Large numbers of them, on their first arrival at camp, are reported as discontented and dissatisfied. Under the benefits of camp life, which result, even in the first few weeks, in improved health, as shown by rapid gain in weight, the vast majority settle down and adapt themselves contentedly, generally enthusiastically, to a life better calculated to insure peace of mind than any they had previously known. For this reason, during the first few weeks after arrival at camp, rejections of drafted men should be made only for unquestionable defects and no estimate of the frequency of malingering should be attempted at this time. It is also evident that a reasonably long probationary period prior to mustering in is essential to the eradication of malingering. In contrast with those of the National Army, malingering to evade service in the National Guard cantonments has been practically absent. From only one of these cantonments come reports of self-inflicted wounds in men off duty. The difference in malingering between these two classes of soldiers has been conspicuous in those cantonments of the National Guard to which drafted men have been sent to complete unfilled regiments. More malingering for the purpose of evading service has been observed in these transferred quotas of drafted men than had been previously observed in the whole National Guard division. The factor of voluntary choice has, of course, most to do with the conspicuous infrequency of malingering in the National Guard, but it should also be remembered that most of the enlisted men of this branch of the service had already served during the mobilization on the Mexican border in 1916, so that probably most of the malingerers had already been cleared from the ranks.

The same infrequency of malingering is noted in the volunteer army as in the National Guard, and this in spite of the fact that voluntary enlistments were so greatly stimulated upon the inauguration of the draft. The surgeon of the Columbus Barracks Recruit Depot post writes as follows:

> Considering the large number of recruits examined, there has been little malingering (with the object of avoiding service) at this post. The reason for this is the fact that the recruits have volunteered during the war and the natural presumption is that, with very few exceptions, they have desired to enter the service and fight. This was especially so during the months following declaration of war. Besides, volunteer applicants reporting here have been selected from many applying at recruiting stations in Ohio and the surrounding states, and most of the potential malingerers have been weeded out. By far the largest number of malingerers here have acted with a worthy and not an unworthy

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motive, *i. e.*, they have endeavored to conceal a disqualification. Those who have malingered to avoid service can be broadly divided into two classes: (*a*) those applying honestly primarily, but subsequently changing their minds, either as a result of homesickness, or a belief that service might present hardships that they did not think of when first applying for enlistment; (*b*) those applying with the deliberate purpose of being physically rejected. Class (*a*), with no preliminary or definite idea of how they will malinger, are usually very crude and easily detected. Class (*b*) have worked out various methods of attack and require more time to detect. Very few of them, however, show any great skill. The reason that this class tries to avoid service is to escape subsequent draft by showing a rejection for physical disability, or to pose as decent men when they are slackers. The majority of them are actuated by selfishness, the minority by lack of ordinary physical courage.

2. *To Avoid Duty.*—It is obviously impossible for a medical officer always to be sure of the exact motive which lies behind an attempt at malingering. Probably a majority of those who are reported as malingering for the purpose of avoiding duty would accept discharge if they had the chance at the time. They might apply again for enlistment, but would nevertheless leave the army at the moment of their fancied grievance. It is probable that many of the frequent cases of paralysis of one limb, in all of which there is a strong hysterical element, are associated with wishes, momentary though they may be, to be quit of service. These only half-conscious pretenders lack the persistence to carry it through, and the quality of the motive ascribed to them should really be referred to in terms of their own childishness. Such a case is reported from Camp Logan:

Enlisted man gave history of being kicked by a mule, at the junction of the sternum and clavicle, on the right side. Absolutely no external signs of an injury at any time. Patient complained of a complete paralysis in the entire right arm. Claimed to have absolutely no control in the arm, and insensible to pain. After a very close examination of this man, and being of the opinion that he was a malingerer, we threatened to send him to base hospital and, under an anesthetic, give him certain tests that he would not be able to fake on. He, being of the opinion that he would be caught up, had a very remarkable cure over night, felt a jolt in his shoulder and gained complete control of his arm.

But while it is difficult or impossible to be sure of the motive in individual cases, the general consensus of opinion that men making these minor complaints do go back to duty and make good soldiers, leaves little reason to doubt that the troops of the present mobilization, after they have become accustomed to army life, are not possessed with desires to leave the service strong enough to cause them to feign disease persistently.

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"Sodgering" is as old as armies. It is resorted to by men who do not necessarily want to get out of the army, but who are chronically interested in getting out of all the unpleasant and fatiguing duties they can. To this end, they exaggerate every minor ailment that they can, complain of pains, headache, lame backs, sore feet, and in fact of all the complaints common to any free dispensary. They may be average good soldiers, but lack pride and a sense of responsibility. They may not shun ordinary duties, only the disagreeable ones such as guard duty and hikes; for example, men complaining of flat feet try to get out of the marches only. They are familiar to all regimental surgeons who hold sick call, and only a few of them ever get sufficient encouragement to reach the base hospital. The motive behind malingerings of this kind is plain from the fact that they become much less frequent on Sundays and half-holidays. To counteract this tendency, it was required at one camp that unless men marked "quarters" report at next sick call they would be put back on duty. In another, where an evening sick call was established, complaints of this character were much less frequent at the sick call which ended the day than at the one which began it. The following is an example of a case in which symptoms are resorted to to effect a change of duty.

Recruit, aged 22. In service about six weeks. Reported at sick call complaining that he had almost lost the use of his hands. He was given some simple directions, but appeared daily at sick call for three days, each time complaining that he was losing the use of his hands. He was then admitted to the hospital for observation. A careful examination resulted in negative findings. By that time he was scarcely able to dress himself. He was put on liquid diet and, after four meals of this kind, complained of being hungry. Just prior to the next meal he was told that he could go to the mess hall for that meal if he could dress himself before going. He promptly dressed himself without difficulty and it was observed that he had no trouble in handling his knife and fork during the meal. On returning to the ward after the meal, he again found that he could use his hands only with great difficulty. He was at once interviewed by a medical officer and, after a short talk, found that the trouble with his hands had entirely disappeared and he was ready to return to duty. On investigation, it was found that, a few days prior to the appearance of his illness, he had been given work with the kitchen police and was much dissatisfied with this work. He acknowledged that he thought if he persisted in his complaints of inability to use his hands he would be given work which suited him better. It seems that he had once known a patient who had paralysis involving the hands and forearms. A warning as to the serious consequences which might follow malingering was sufficient to make his cure permanent.

There are men who for various reasons get angry with the officers, especially noncommissioned officers, and, for spite, evade all duties

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possible. As this can only be done by fooling the medical officers, they come to him complaining of various and indefinite pains. The malingering, as a rule, lasts no longer than the cause of it and the man returns to duty a good soldier.

3. *To Obtain Service.*—The most frequent form of falsification for the purpose of obtaining service is the concealment of immaturity, boys of fifteen, sixteen and seventeen passing themselves off as eighteen and over.

This form of malingering is mostly limited to volunteers, although occasionally drafted men conceal disabilities for the purpose of being accepted or of remaining in the service. One such, stone deaf, a skillful lip-reader, passed the exemption board and the preliminary examination at the camp, his disability being finally discovered because he was unable to execute commands.

At recruit depot posts, chronic alcoholics endeavor to conceal their disability for the purpose of obtaining service. Next to them in number are epileptics who conceal their histories. It is stated that the former want to enter the service in order to gain the livelihood they cannot earn outside, while epileptics appear nearly always to be actuated by an honest desire to serve their country. Many of them make every attempt to remain in the Army. In one case at Camp Upton, a man who had been twice discharged from the Army under previous enlistments concealed the fact of his previous discharges and the disease, in order to be accepted under the draft. When, after having convulsions, he was about to be rejected, he announced his determination to join the Canadian or English forces. Drug addicts occasionally try to conceal their habits and are apt to choose for service the Medical Department, perhaps by reason of former associations or because they think they will there have better opportunities of obtaining the drug.

4. *To Obtain Exemption from Punishment.*—A soldier was to be tried by a general court-martial. A few days before the trial he requested an examination by a mental specialist. He claimed mental aberration due to a blow on the head, which the psychiatrist who examined him considered wholly feigned.

Soldiers in confinement are always prone to exaggerate and magnify their complaints, and the sick call for prisoners is always large. It was regarded as a praiseworthy evidence of patriotism in Germany, at the outbreak of war, that the complaints of prisoners diminished by half.

5. *To Obtain Transfers.*—This does not appear to be an important motive for malingering in our troops. A few men have made complaints of pains in the feet with the idea of being transferred to the Quartermaster's Corps, and timid men have sought transfer to the

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Medical Corps, either on their own initiative or that of their company commander, on the understanding that the work was easier and less perilous. One conscientious objector applied for transfer to this corps and was told that he would be stretcher-bearer in No Man's Land. He conquered his scruples and stayed where he was.

Suggestion.—The factor of suggestion through a cause is so important that it requires separate mention. As it concerns the recruits of the present mobilization, it must be considered from two angles, viz.: the suggestions which arise from the immediate surroundings, and the effects of those suggestive influences which the recruit had gone through in the past and which he brings to camp with him as part of his equipment.

As far as the first are concerned, waves of nervous symptoms have always had a tendency to sweep over and more or less disorganize large bodies of men. They become less and less noticeable as discipline is perfected, but at the beginning they are readily communicable. For example, among the present recruits, men coming from the same communities show a similarity or identity of their symptom. In certain organizations there was such an agreement as to suffering that the same nervous complaint would be made simultaneously by large numbers. Complaints of flat feet run in companies, and various outside influences would have the effect of calling forth, all at once, a large crop of related ailments. Lectures would create apparitions of the diseases lectured upon. One admission for a given disorder, to a base hospital, when it was the only building provided with stoves, would be rapidly followed by many other disorders of the same kind. At Camp McClellan, in October, a bed wetter was admitted one night, three bed wetters the next night, and, on the third night, there were no fewer than sixteen bed wetters in the hospital. The visits of special boards are apt to be followed by an increase in complaints of the special diseases the boards were sent to eradicate, *e. g.*, complaints of hemoptosis following the tuberculosis board, of pain over the precordium after the cardio-vascular board, tremors and flat feet after the boards of neuro-psychiatry and orthopedics. Complaints are regularly volunteered for any disability for which S.C.D. is given. It is probable that many such cases owe their origin to the examiner's habit of talking conditions over before the men and of asking leading questions. One division surgeon noted a great improvement when he had admonished examiners in these matters. Such symptoms are usually created before the patients reach the base hospitals. But there the symptoms run the risk of becoming fixed, and new ones are created by imitation. Tremors, fits, paralysis, etc., can often be traced as to origin, as being suggestively transferred from one patient to another.

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But in contrast to this immediate or contemporary suggestion, so common to crowds and so readily recognizable, is another variety which has warped the lad's courage and independence in the past. This has come to him through "old wives' tales" of all kinds, from his visits to anatomical museums, from quack advertisements, from over-solicitude for his health on the part of his parents, from the statement of ignorant or unscrupulous physicians who have treated him for years for "stomach trouble," who have told him that he had a weak back, that his kidneys were not strong or that he would develop hernia or break down under the strain of army life. By these means his mind has become weakened in its powers of discrimination, and under the excitement and homesickness and fear of the first few weeks of separation from what he had always been accustomed to, when he feels the fatigue or pain of the unaccustomed exercise, he comes to believe that what he has been warned of in relation to his health has arrived. Others have always been coddled at home and led to believe that they were delicate, unable to stand hard work, and never risked trying it. A number of letters have come to the Surgeon General's office from parents requesting the discharge of their sons mustered into the service, urging discharge on the ground of delicacy. Inquiries concerning these sons have brought out the information that they were at last in perfect health and personally had no wish to be out of the service. The attitude of some parents in such matters is typified by the remark of one father who, on being told that his son was not paralyzed, but had a functional disability which would quickly recover and which was not a cause for discharge, exclaimed "I am awfully sorry to hear it."

The effects of suggestions of this kind, while responsible for many of the cases of fancied illness called malingering, are not always immediately recognizable as such. To get at their true nature implies that the examiner must establish between himself and the recruit some relation during which the whole story comes out. The reports of the present inquiry abound in instances of recruits who went back to their duties cheerfully after the medical officer had confidentially assured them that there was really little or nothing the matter with them.

Detection and Management.—The present method of inquiry was chosen for the reason that few of the books on malingering give a representative idea of the condition, as it is being observed in the U. S. troops today, nor of the best way of treating it. Our records show that the malingering recruit of the Army is rarely the resourceful juggler of the books, who is only to be caught in the same traps that are his own stock in trade. There are still some of these, but too few to constitute a real problem. There are still to be found malingerers of the

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criminal type, who have aptly learned their lessons in reformatories and similar institutions, drug addicts and gangsters, recent products of the cities, who are inventive and resourceful in all forms of deception. The acrobats and contortionists still dislocate their joints or cause contracture of certain muscles at will (the latissimus dorsi in one case), and the low comedians continue in the Army the same methods of deceiving their audiences as had previously brought them a livelihood. But these are the exceptions, and when they succeed they do so, not because they mimic disease well, but because the examiner is professionally unskillful and personally less watchful and adroit than those it is his duty to detect. The great bulk of malingerers who constitute problems for medical officers are simple, credulous, impressionable boys, who exaggerate and invent without skill, or with no definitely conceived plan. To detect them—to understand them is a better expression—requires accuracy in diagnosis, knowledge of human nature, and especially knowledge of the types of persons who chafe under military service and why they do so. One prevalent idea seems to be that the malingerer is to be "unmasked" by specially devised tests. The fact is that, with the exception of cases in which deafness or blindness of one side is claimed, the only tests or instruments required are those regularly employed in medical diagnosis. The final method, and one which is now generally practicable in the Army, consists in a stay in hospital wards under the observation, when necessary, of specialists.

As a practical issue, the detection of malingering has been narrowed down to the recognition of self-induced, factitious conditions, and to the estimation of the degree of exaggeration in complaints of actual or preëxisting diseases, conditions or injuries. With the exception of self-mutilation, such as the cutting off or shooting off of fingers or toes, a brief hospital sojourn is usually sufficient to show up the fraud underlying self-induced symptoms and inflammations.

As concerns the exaggeration of existing defects, the medical officer has two practical questions to decide: One is, do the complaints concerning present discomfort and suffering, as compared with the actual conditions found, transcend common sense and medical experience? The other concerns the determination of the motives which led to the exaggeration. The first is a purely medical question, and can never be answered with assurance unless the physical examination has been painstaking and thorough. In this connection, it should be remembered that examination which show the absence of disease confirms a general appearance of robust health. It may also disclose evidences, such as local callosities on hands alleged to be useless, or on feet which the recruit says have been paralyzed for months, which absolutely contradict all

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complaints as to disability. When the examination has fulfilled these conditions and the complaints contradict the actual findings, an investigation of the motives should be made for the purpose of substantiating the suspicion of malingering.

The real motives can only be appreciated if the type of personality is brought up to the surface, and this can be best done if the man under investigation be allowed or induced to tell his own story. This is easiest with persons of some intelligence and education, for such, in contrast with dull, untutored persons, lay themselves open to suspicion when too reticent. Those who talk freely can be counted on, with almost absolute certainty, to say things quite at variance with the possibility of the disease existing of which they complain. The questions are better put as a rule, and the answers more readily comprehended, when the examiner is from the same part of the country as the recruit and familiar with the social conditions of the particular community. The motives for deception will be found inextricably bound up with the man's life history, but the questions put to elicit them should appear as part of the regular medical examination. Even if the examiner's suspicions are aroused at the start, his attitude at first should be that of the inquiring, impartial physician, not that of a court officer.

He should get all his facts before letting the recruit see that he is under suspicion. The questions should result in information about the recruit's family relationships, his progress at school, his industrial career. Was he happy at home? Did he ever run away from it? How far did he get in his schooling? Was he a truant? What led him to choose the the career or careers he had followed before entering the army, and did he change them frequently? How much did he earn and what did he do with his money? What have been his relations with women and children, and had he ever deserted women who were dependent upon him? The answers to such questions will often flatly contradict the possibility that his present claims are genuine. It is highly important to discover the man's mental attitudes and the character of his general ideas. What has been his adjustment to general social conditions? Has he been a "good mixer," or solitary, secretive and morose? Does he bear grudges against a good many people with the idea that they are trying to get the best of him? What have people thought and said of him anyway? Does he think the world a good place to live in and enjoy? If not, why not? What are his views as to war and the rights of the individual? The various causes and motives of malingering mentioned in the preceding paragraph should be borne in mind during this inquiry.

It is especially important to direct questions toward the suggestions the recruit may have received in regard to his health, for many healthy

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recruits are themselves convinced of their own weakness and frailty, and when assured to the contrary they go back to duty with the air of having a great load taken off their minds. Here explanation and persuasion may be turned into an effective means for detection and cure. In the same way, appeals to manliness, references to fraudulent enlistment, threats of court-martial, or of disagreeable duty, statements that the complaint alleged is not a disqualification, identify or remedy malingering. One officer finds it important to use a tone of voice suitable for each class: For the talkative malingerer, a conversational tone; for the "sigh and sob" malingerer, a sympathetic tone; for the stubborn malingerer, a quick, sharp tone.

Patients sent to base hospitals are apt to become careless and be off their guard, to be seen to move limbs supposed to be paralyzed, or in other ways to give positive proof that their claims have little foundation in fact. Light diet, disagreeable medications, etc., cause many pretenders to give in, and the special diagnostic equipment of base hospitals sets the malingerers an almost unsurmountable task.

Anesthetics for diagnostic purposes are frequently given, as, during semi-consciousness, the patient often says things which contradict previous statements. During anesthesia, also joints held immovable for a long time are shown to be freely capable of full movement, although the absence of organic disease, proved in this way, does not exclude functional nervous disease of extremely persistent character.

Distraction of the attention is an important aid in the detection of malingerers—the patient should be examined for one set of symptoms, while he believes himself under examination for something else. By these means he is taken off his guard, and is discovered by the factor of surprise.

The general management of malingering in a military organization consists in efforts to suppress as far as possible all the influences which have been shown to be causes, and the issuance of such orders as will tend to make malingering difficult and disagreeable. Examinations should be conducted, as far as possible, without the recruits knowing the details of them and without their hearing discussions of the cases. As many cases as possible should be disposed of without being sent to the hospital at all, and those sent should not be told why they were sent. The inference of actual illness should always be kept in the background. Visits of friends and relatives should be discouraged, especially in the early days of mobilization. Firmness and avoidance of sympathy are essential. Various orders have been reported as diminishing malingering, such as penalizing the soldier his weekly holidays, if on company sick book and marked "duty" by the surgeon; treatment of complaining by

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confinement to quarters, when not on duty, for the week, and forbidding visits to any places outside of camp, etc. It has been said that the "war neuroses" have been kept in check in the French Army because the soldiers generally understand that these neuroses would not constitute a cause of discharge.

When it has been satisfactorily proved that there is no basis in fact for the disability claimed, sufficient to warrant exemption from service or duty, there still remains the question, what to do with the soldier who adapts himself to military life in this unsatisfactory way. Court-martials do not seem particularly adapted to meet this situation, and, as a matter of fact, most of these offenders are returned to duty unpunished. In the cases of the individuals in whom the attempts at deception can only be considered as symptoms of a long-standing neurosis it is necessary to decide whether they can be turned into useful soldiers under any conditions. Many of them cannot, and such must be promptly discharged. It is, however, believed that some of this class who are at present discharged could, after the exact type of their neurosis had been determined, be made militarily efficient under drill, strict discipline and duties, selected during the period of their reconstruction. The following expression of opinion from a medical officer merits careful attention:

> I believe that fully two-thirds of the cases I have seen would make good, useful soldiers if they could be properly apprehended and handled. There are so many borderline cases in which it is so difficult to determine how much real disability exists, and how much is simulated, that it has occurred to me that, in a place of this size, it might be profitable to have all wards send their doubtful cases to one ward, and place them under the care of one man, who could devote his attention to this class of cases.

(*To be continued*)

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SOME OBSERVATIONS ON INJURIES OF THE HEAD

By Major HOMER GAGE

Medical Reserve Corps, United States Army

ALTHOUGH injuries of the head demanding surgical interference must of necessity be rarely met with in a cantonment Base Hospital they are of frequent occurrence in the zone of action and of the greatest importance—varying in severity from the slight scalp wound to the comminuted depressed fracture of the skull complicated by the presence of one or more foreign bodies in the brain.

There is no class of injuries which calls for the exercise of greater judgment in determining when and how much operative interference is indicated, or which demands a higher degree of technical skill in operating in order to minimize the chance of increasing an already serious hazard. It is therefore essential that anyone who contemplates surgical work at the front should, so far as possible, familiarize himself with a general knowledge of the emergencies which constantly attend its practice.

I am quite conscious of my own inability to give you anything that is novel about the subject, but in response to request I will try to state briefly the important points in the treatment of head injuries as they have been impressed upon me by the experience of an active surgical service in a municipal hospital, and will supplement that by some references to the experiences of the European surgeons as reflected in the current war literature.

In the first place one fundamentally important thing for us to remember in considering head injuries, by which term for the purposes of this discussion I mean only injuries involving the cranium and the brain, is that injuries to the bones of the cranium are of importance only as they expose or injure the brain and its membranes. If it were not for this the bone injury would require little, if any, interference. It would certainly present no difficulties.

In the second place, remember that anatomically the cranium is a hollow shell with sufficient elasticity to bend and to rebound, thus changing its diameter under the impulse of a blow and making an important difference in the mechanism by which its injuries are transmitted. For example, the injury may result in a local bending with the lesion at or under the point of contact; or it may result in a bursting of the wall opposite the point of contact with a consequent distant lesion, the most common illustration of which would be a blow upon the vault causing a cracking of the bones of the base; or lastly, the injury

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may result from the expansive force of a missile passing through the skull at high velocity—an explosive injury.

These are all helpful points in diagnosing the nature of the lesion in a given case and emphasize the importance of getting at the exact nature and direction of the forces applied. The smaller the point of contact between the force and the bone the more likely is the lesion to be the result of bending of the skull and to be localized at the seat of injury, as in a blow from a hammer; *e. g.*, while the broader the point of contact, as in case of a large blunt instrument or a fall on to the vortex of skull, the more likely is the injury to be a bursting one on the opposite pole of the hollow skull.

Bearing in mind these underlying principles, let us look for a moment at the picture of head injuries as we ordinarily see them in the accidents of civil life.

In the milder cases we see a partial unconsciousness from which it is possible to rouse the patient by voice or touch, or a condition not unlike that of a drunken stupor, followed by headache, dizziness, nausea, vomiting, etc.; and if the recovery is steadily progressive, even though slow, we call it concussion.

If the stupor persists and deepens and evidences of compression supervene with delirium, restlessness, slow pulse, choked disc, etc., we call it contusion, and say it has resulted in hemorrhage. As a matter of fact I think that Kocher's view that both conditions are due to hemorrhage is most reasonable; in the milder cases the hemorrhages are microscopic and widely scattered, in the severe ones larger and more localized. In other words, in all cases where definite symptoms of cerebral disturbance supervene I believe the pathology to be one of hemorrhage and brain laceration, minute and microscopic, if you please, in the milder cases, but always laceration.

This was illustrated in a recent case of a young girl struck by a trolley car in a collision—"no sign of external injury, unconscious but would respond to stimuli, appeares to be a simple concussion." As she did not recover consciousness and was increasingly restless the diagnosis was changed to severe contusion, and as she grew steadily worse it was changed again to probable fracture of the base. Autopsy revealed no fracture, but numerous punctate hemorrhages scattered through the brain, the largest in the corpus callosum as large as a pea with a surrounding area of softening.

I think this is a fair illustration of how the terms concussion and contusion are really misleading if used to describe essentially different conditions, but are correctly used only to express a mild or a severe

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type of cerebral injury with the same pathology, viz., hemorrhage of greater or less severity.

An important variety of the severer type is that which presents an interval of from a few minutes to a few hours of complete consciousness followed by a steadily deepening coma with slow pulse and progressive unilateral paralysis; this represents the typical picture of middle meningeal hemorrhage which often exists without fracture and without any injury to brain substance.

Unless quickly relieved, death follows usually within twenty-four or forty-eight hours from increased intracranial pressure; localization is easy from the presence of a limited one-sided paralysis, and the operation constitutes one of the most striking and satisfactory surgical procedures that I know of.

The effect of the injury may not be limited to a simple concussion or even contusion; it may be the result of a violence greater than this, and sufficient to break the skull in which the brain is contained. This leads us to the consideration of fractures of the skull; just as in the case of the long bones, these fractures may be simple or compound, according as the scalp is or is not intact, and both simple and compound fractures of the skull may or may not be comminuted.

Into the natural history of the compound fractures enters, as it does in all fractures of all bones, the element of possible infection; aside from this possible complication it makes little difference whether the fracture is simple or compound or even if it is comminuted or not. The important factor is the effect of the fracture on the brain and its membranes: the vital question to be asked is: Has the brain and its membranes been injured, and, if so, can we do anything by way of repairing the damage?

In either form of fracture we may have intracranial hemorrhage and the hemorrhage may be accessible or inaccessible—we can often do but little to control it or to prevent the softening which often accompanies it—in either form we may have the edges of a fracture or the pieces of a comminuted fracture driven into the brain, and then we call it a depressed fracture, and the important thing about it is the depression. Because, as we said at the outset, we are concerned not about the fracture—that will take care of itself—but about the effect of that fracture on the underlying brain, that is the one thing that must never be lost sight of.

In considering perforating wounds remember that they are really depressed fractures, and that the bones of the skull have an inner and an outer table; the effect of a perforating wound is therefore often to splinter the inner table more than the outer, leaving small fragments

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penetrating the brain. These, if overlooked, are apt to have an important influence on the future health of the individual.

Besides knowing something about the kind of fracture it is important to consider its location. For this purpose we may conveniently divide them into fractures of the vault and fractures of the base, always bearing in mind that in the bursting fracture the fissures may pass from one area to the other, *i. e.*, a crack in the temporal or parietal region may pass down through the base. All depressed fractures are of course included in the injuries to the vault and in certain areas, particularly the frontal region, these may be very severe, accompanied by extensive laceration of the brain even with considerable loss of brain tissue, and yet have few symptoms of brain injury. Over the motor areas, on the other hand, lesions of much less apparent severity may result in most serious impairment of function.

The fractures of the base are always fissured fractures, which usually pass through the anterior or middle fossa, and are really compound, because they communicate with the nose and its accessory sinuses or with the mouth or ears. The danger of infection is always a serious one and every effort must be made to keep the communication clean, *e. g.*, in fractures through the petrous portion of the temporal bone with bleeding from the ear, be sure to wash out the external auditory canal with a mild antiseptic like boric solution and keep it closed with aseptic absorbent cotton.

I have always observed that those fractures of the base that bled freely externally were the most favorable. But one is often surprised by the steady improvement that takes place in these most serious injuries and can only conclude that, if the danger of septic infection is safely passed, death results only when there is extensive intracranial hemorrhage complicating, but not the result of, the fracture.

Operating for the relief of the severe cases of fracture of the base by decompression operations as advocated lately by Cushing has never appealed to me, perhaps because I have never given it a fair trial.

If the symptoms of increased intracranial pressure are due to hemorrhage outside the dura or in the membranes, decompression might give just enough leeway to prevent a fatal pressure, but in these cases the fracture itself often permits of sufficient hemorrhage to accomplish the same purpose, and if the hemorrhage is within the brain the damage is already done and the relief of pressure on the outside cannot restore the function of the destroyed area or prevent the secondary softening. For myself, therefore, I believe that fractures of the base should not be subjected to the additional risk of operation.

In making a diagnosis of fracture there are but one or two points

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of importance that are not obvious, on careful inspection, after getting an accurate history of the sort of traumatism and the onset of symptoms.

These are, in simple fractures, to distinguish between a true depression and the indurated margins of a simple hematoma of the scalp. After one has been once misled by this indurated edge with its soft center, as I have been, he will never forget to look for it. Even then it is not always easy to recognize it. Its regularity of outline, with a soft center, taken in connection with the character of the instrument which inflected the traumatism will, however, usually suffice to prevent an unnecessary operation—experience does the rest. The important thing is to remember that a simple hematoma may be very deceptive.

Another point in diagnosis is the use of lumbar puncture as a means of establishing the laceration of brain tissue; a bloody fluid means hemorrhage and laceration, with or without fracture, and at the same time is a means of relieving intracranial pressure. It should never be overlooked as a means of clearing up a doubtful diagnosis and especially of discriminating between simple concussion and extensive cerebral injury.

Of the dangers and complications incident to these fractures of the skull the immediate are hemorrhage and sepsis. Hemorrhage is to be controlled by operation except in the case of fractures of the base where it seems to be distinctly advantageous, and is never profuse enough to endanger life. Sepsis, with its accompanying meningitis, is fortunately rare in the accidents of civil life, because we usually get at the cases early, before infection has time to occur—and if it does occur, is usually evidence of too long delay before operation or of faulty technique.

The dangers and complications which are late manifestations are paralysis, mental defects and epilepsy. When these are the result of destruction of brain substance by the trauma, little can be done by way of relief. The removal of foreign bodies including loose spicules at time of operation, closure so far as possible of defects in the dura and a careful toilet of the wound, to limit as far as possible scar formation and adherence of dura to bone and scalp, will do much to lessen the probability of their occurrence.

When at operation the depressed fragments of bone have been elevated and all loose and sharp spicules removed, look carefully at the condition of the dura; if it is dark or cloudy and does not pulsate, make a small nick in it to determine presence or absence of subdural hemorrhage.

I once operated on a man who had become insane after a blow on the head with a hammer, whose insanity was marked by periodic outbreaks of great violence ending in convulsions. Eighteen months after the

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injury I found a blood cyst, or old localized hemorrhage, in the subdural space, the evacuation of which was followed by complete relief from the outbreaks of violence and the convulsions, and by an improvement in his mental condition sufficient to enable him to return to his home. The cure, of course, was far from complete, but the important lesson to be derived from the experience is that evacuation or drainage of that hemorrhage, at the time of the injury, would have avoided all of the subsequent trouble. So if the dura is clear and pulsating do not open it, but if you are in any doubt, nick it, and if hemorrhage is present, drain it.

As regards rules for operating, I will simply state briefly those which I have derived from my own experience and which I try to follow:

1. In all cases of localized pressure, as determined by localized symptoms of paralysis or cortical irritation, operate.

2. In every suspicious border line case, determine condition of bone over suspected area by exploratory incision of scalp.

3. In every depressed fracture simple or compound, with or without symptoms, elevate.

4. In all depressed or perforating wounds remove all sharp spicules of bone that can be felt loose or detached in the wound; leave the edges of the bony opening and the under surface of the skull around it clean and smooth.

5. Remove foreign bodies always if they are likely to cause infection, or if they are giving rise to symptoms—in other cases, *e. g.*, in case of small bullets, remove when possible without too much traumatism to the brain, remembering always that the possibility of such becoming harmlessly encysted, is better than the certainty of destroying important cerebral centers.

I have thus sketched in a very imperfect and, I fear, very tiresome way, some of the general principles underlying the care of head injuries in civil practice. To bring the picture down to date and to illustrate its application to the problems which our surgeons in the field will have to face, I venture to ask your indulgence for just a moment while we mention some of the problems which have arisen in the practice of our allies during the present war.

One of the most important and most frequent questions that appear in the journal articles of the last two years is: Where shall the operation be made? How near the front?

England, France and Germany agree that operation should be done as soon as possible after the receipt of injury, but they are equally insistent upon getting the wounded back at least to the evacuation hospital if it can be done. After operation they should not be moved again until convalescent, so that if they are primarily evacuated to a field ambulance or field hospital nothing should be attempted there

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except the shaving, scrubbing, trimming and dressing. They should then be immediately evacuated to a more quiet and permanent hospital where operation should be done at once if indicated.

The next question is, how extensive should the first operation be? Here the English and German are inclined to be rather conservative, while the French are much more radical—all agree that the first thing to be done is to trim off any crushed and infected tissue, so that the danger of sepsis, which is rendered much greater than in civil life by the nature of the wounds and the delay in transportation, may be minimized.

If received at an evacuation hospital the French advocate doing all that is necessary at once—even to removal of foreign bodies. This latter is accomplished after careful X-ray localization by the use of the little finger and a gall-stone scoop, the wound is closed without extra dural drainage and dural defects closed by pieces of fascia or with rubber tissue. Personally, I should much prefer the latter.

The English and Germans lay the same stress on thorough removal of devitalized and infected tissue and on closure of wound with only extra dural drainage, but are much less inclined to remove deep-seated foreign bodies unless indications, *i. e.*, symptoms, are very clear. Sergeant and Holmes found the late results of those wounded, evacuated to hospitals, in England so good that they recommended only such surgical interference at the front as may be called for to establish necessary drainage and the healing of the wound.

It seems to me that the two points of view are not very far apart after all. Whenever possible, the foreign body should be removed, and this is the more important in war injuries because, as Von Eiselberg points out, while an extensive experience in peace time has taught that projectiles in a large percentage of cases heal in without reaction, since the war began it has been the experience that, in the majority of cases, the projectile causes a local abscess which can be avoided by early removal.

One form of wound not often met with in civil practice is the tangential wound caused by a glancing blow from projectile of high velocity. The peculiar danger of it arises from the fact that without injury to the outer table of the skull, the inner table is often badly shattered; such wounds must, therefore, be carefully explored and the skull trephined.

An interesting work, in the way of reconstruction, has been done by the French in filling up defects in the skull with pieces of cartilage taken from the cartilages of the ribs; a shaving one-sixteenth to one-eighth inch thick taken from the rib cartilage, its full width and length if possible, is placed in the defect.

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THE CASE FOR THE MORE EFFICIENT TREATMENT OF LIGHT CASUALTIES IN MILITARY HOSPITALS

By Major ROGER I. LEE
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ONE of the essentials of a military hospital, whether at the front or at the base, is its elasticity. While theoretically every sick and wounded soldier well deserves to be cared for in a hospital bed, in a hospital ward, yet practically at the time of military activity this is impossible. Furthermore, many of the wounds and the ailments of the soldier are so trivial that hospital ward treatment, as it is usually understood, is not necessary.

From my own observations in British base hospitals in the summer of 1915, and since the 30th of May, 1917, I am led to the conclusion that in the British hospitals the serious case is admirably looked after. He is given a bed in a ward, he receives the best surgical skill, adequate nursing, and every possible consideration, subject only to the inevitable discomforts of transportation and care in the war zone. Under the circumstances his condition could hardly be improved. However, one cannot fail but be impressed by the fact that the best medical and surgical skill and the best nursing are devoted to the care of men who will very likely be cripples, certainly physically and probably economically, for the rest of their lives. From a military point of view, these men are as a rule of no future value. Of course every standard of humane consideration demands that those who have become maimed in the service of their country should receive every possible attention, and this should be begrudged by no one.

On the other hand, the lightly wounded case, and the case with a trivial medical ailment, may be looked upon as unworthy of the best medical and surgical skill, in comparison to his more seriously sick or wounded brother soldier. This same tendency exists of course in civil practice. It is obvious that for military purposes the slight casualty, either medical or surgical, is a real asset, and the promptness of his return to active service will go far to increase military efficiency. In most of the hospitals in busy times these light cases are sent to so-called "Crisis Extension Wards," which amount to barracks either in wooden huts or usually under canvas. The supervision of these cases is often delegated to a junior medical officer. The customary method of procedure is to send such cases to a convenient wooden hut or tent where they are dressed or treated.

The purpose of this communication is to try to point out the advan-

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tages of a first-class department devoted to the diagnosis and treatment of these so-called "light cases." I think that the experience in our hospital (Harvard, U. S. A. General Hospital, B. E. F.) is fairly typical. We have several crisis extension tent wards capable of accommodating several hundred patients. We started out with the system which we inherited, namely, of having a junior medical officer in charge of each one of these several wards, and another junior medical officer, who, in addition to other duties, undertook the burden of the dressing tent, which was generally regarded as a chore. Cases were sent in a somewhat haphazard fashion to this so-called dressing tent, where wounds were examined and dressed. There were no facilities for even the most minor operations, and inadequate facilities for more than routine simple examination and simple dressing.

As time has gone on the importance of these so-called "light cases" has impressed itself upon us so much, that now the extension wards are under the charge of the Head of the Medical Section, and the Head of the surgical section has, as one of his most important duties, the supervision of the dressing tent. Here he is found at definite hours during the day and personally examines and prescribes with great care for many cases, while supervising all the work there. Many cases, apparently trivial, turn out to have not only retained foreign bodies and fractures, but very severe infections. The danger of gas infection and tetanus is, of course, always present. Certainly there is wisdom in devoting the best possible skill and experience to the greatest number of cases, and to the cases that are of the greatest military value. However, in general, this has not been recognized, and usually inadequate facilities are provided for the necessary thorough treatment of these cases, which is essential for the prompt restoration of a large body of men to active service. A man with boils, or with a small sluggish, granulating wound, or with a trifling medical disorder, adds one to the hospital list and subtracts one from the list of the available fighting force just as much as the man with a shattered leg. Furthermore, incorrect decisions as to the disposal of cases mean delays in the return of fighting men, or useless transportation to the front and back to a hospital.

It would seem, therefore, that a proper solution would be to have what is known, at least on the Atlantic seaboard in the United States, as an out-patient department, especially designed and adequately officered for the treatment of these cases. It must be remembered in this connection that, after all, a military hospital is a combination of ward and ambulatory patients. In contrast to civilian hospitals, one frequently sees, in the same wards, patients who are critically ill or seriously wounded and those who have little the matter with them, and who in

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civil life would be treated in an out-patient or dispensary department.

It would seem wise to recognize this fact as has been done in many of the large civil hospitals, and to have a somewhat distinct, but at the same time closely related, out-patient or dispensary department for ambulatory patients. By this distinction it would be possible to concentrate special ward attention on the very sick and on the seriously wounded, and likewise, by the furnishing of adequate facilities, to care for effectively ambulatory patients, who are of so great value from a military and economic viewpoint. The ambulatory patients could be adequately housed in barracks with a minimum requirement for nurses and orderlies.

This would mean the establishment of an out-patient or dispensary department in connection with every hospital. It seems to me that this should be as thoroughly done as the establishment of an operating pavilion, etc. The out-patient department should be commodious, built of wood, with adequate light and heat if necessary. It should have adequate facilities for the dressing of all wounds. There should be a room for minor operations, such as the opening of boils, small abscesses, and the removal of subcutaneous foreign bodies. This, in itself, would prevent the overcrowding of the main operating pavilion, which is now inevitable in times of pressure. There should be opportunity for complete physical examinations. The various specialists should have compartments or rooms for their use. I refer now to the dental department, the eye, ear, nose and throat departments. At present they are usually crowded into the operating pavilion, yet the patients treated there are nearly always ambulatory. There is much more reason that these specialists should be, as in civil practice, concentrated in the out-patient department. Furthermore, there might well be special accommodations for neurological and other examinations, and even for limited laboratory examinations.

Our experience has indicated to us that the usual X-ray equipment in the base hospital is hardly adequate to take care of both the severe cases and the light cases. Yet, in connection with the light cases, the determination of the presence or absence of a fracture or foreign body is often the deciding point as to the disposal of the case. It would be well to consider the establishment of an X-ray plant, of relatively small capacity, in direct connection with the out-patient department. This would add greatly to the efficiency of the organization.

It has now been recognized that the medical man works much more rapidly and much more efficiently when the patients come to him, where he has adequate assistance and adequate facilities and all his tools. The tendency in the past has been to have the medical man go to the patient.

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It would doubtless increase the efficiency of any hospital organization, as well as enable the organization to care for more patients, if as many of the patients as possible could see the medical officer in a central, well-equipped place. Many of the patients who are in wards could be seen to better advantage, from a point of view of rapid handling and efficient treatment, if they were treated in this proposed out-patient department, than if they were treated in the wards.

I would propose, then, the establishment of a suitable out-patient department in connection with each military hospital, whether at the front or at the base. The scope of the out-patient department would be governed naturally by the size of the unit and by the type of case treated by the given unit. It should, however, form an important integral part of the organization, just as important as the operating pavilion. It should be designed to provide for the examination, treatment and dressing of a large number of patients in a relatively small space of time. This number would be presumably from 5 to 20 per cent of the total number at the base, and higher as one nears the front line of activity.

In addition to the facilities for surgical dressing, there should be accommodations for minor operations, for the usual medical examination, and for special examinations and treatments, such as eye, ear, nose and throat. It would be of considerable advantage if this department had its own X-ray plant, and even a small routine laboratory.

Inasmuch as cases here treated are of the greatest military value, and inasmuch as many important decisions as to dispositions have to be made quickly and accurately, the charge of this out-patient department should be delegated to the more experienced men rather than to the junior men.

It is believed that, by the development of such an out-patient scheme, the military hospitals would not only be made much more elastic and capable of caring for more patients, but that the medical and surgical treatment would be better done. It would thus add to the military efficiency, and by the improved facilities of work it could probably be done by a smaller medical personnel, which would release medical officers for other duties.

Such a scheme seems equally applicable to the field ambulance, the casualty clearing station, and to the base hospital.

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ANKYLOSTOMA DUODENALE, A SYMPOSIUM

HOOKWORM IN THE ARMY

By 1st Lieut. EUGENE McD. TRABUE, *M. C. N. G., U. S. A.*

A SURVEY FOR UNCINARIA AMERICANA

By Capt. ROBERT A. KIELTY, *M. R. C.*,

AND

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THE hookworm infections of men are almost entirely of two types. ankylostoma duodenale, or old world species, and necator americanus, or new world species, so-called from its first having been reported from the United States, by Stiles. The male hookworm is a little more than one-third inch (9 mm.) long, and the female somewhat longer than one-half inch (13 mm.). The male may also be recognized by its posterior umbrella-like expansion or copulatory bursa, while the tail of the female is pointed. In general the old world species or ankylostoma is slightly larger and thicker than the necator.

Hookworms may be found in the small intestine of man in enormous numbers, they produce their effects by feeding upon the mucosa of that organ. The delicate shelled eggs pass out in the feces and after one or two days an embryo is formed. It seems that the anaerobic condition present in the intestine tends to prevent the segmentation necessary for the formation of the embryo. Therefore, hookworm ova in freshly passed feces never show more than early segmentation, and rarely show more than four segmentations, exceptionally eight, in freshly passed eggs. In the presence of oxygen these ova rapidly develop into larvae, and by the fifth or sixth day can move actively in their sheaths, so that they crawl up blades of grass and can live in this stage for several months. This is the infective stage, in which the larvae bore their way into the skin, the usual mode of infection, but occasionally they enter through the mouth, on vegetables or otherwise. From the subcutaneous tissues they effect an entrance into the lymphatics and veins, go to the right heart, and from there into the lungs. From the alveolar capillaries they pass into the pulmony alveoli, thence up the bronchi and trachea, to pass out of the larynx and down the oesophagus to the stomach, where the larva loses its protecting sheath and in a few days develops a buccal capsul.

After about four weeks the larvae have become adults, usually in the jejunum, where, after fertilization by the male, the production of the egg begins, the adults fastening themselves upon and feeding upon the mucosa and tissues of the sub-mucosa.

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As to the symptoms of the disease, they, as in almost all such diseases, vary with and in direct ratio to the extent of infection, *i. e.*, the number of worms present, from a mild to a profound type of anemia and, in later stages, toxemia. The gravity of the infection and benefits derived, almost uniformly, from treatment, may be well emphasized by an instance related to me recently by a physician who has had wide experience in the diagnosis and treatment of hookworm disease.

A patient was brought to his laboratory for diagnosis and treatment; his age was 17, though he had the face and facial expressions of an adult of 35 or 40 years and the body and general physique of a child of seven. The mother related to the doctor that the child had never played as other children, showed not the slightest interest in marbles, baseball or games of any kind, and cared no more for a band or a circus than though it were deaf, dumb and blind. In fact it bordered closely upon imbecility. Following the discovery of hookworm and rigid treatment, improvement was most marvelous. He gained 30 pounds in weight in three months, and nearly 2 inches in height in the same time, becoming bright and active and interested in all that a normal boy is usually interested in. He was then placed in school, in the first grade. At the end of a year and a half he advanced from the first grade to fifth, regaining the development, both mental and physical, lost during childhood on account of the infection.

Another instance occurring in the same locality was that of two brothers, growing young men, living on their father's farm with him. After the father's death the management and much of the actual labor incident to the farm devolved upon the boys. It was, however, a poor attempt they made—crops failed, fences rotted, buildings fell to pieces, machinery rusted and the farm became heavily mortgaged. Soon after this an examination of both the boys disclosed the presence in them of hookworm. Treatment was immediately instituted, with the result that they both became apparently new men. The farm began to flourish, crops were good, fences were kept up, buildings rebuilt, machinery replaced and within a few months the mortgage was entirely lifted.

I relate these two instances of severe hookworm infection, which are authentic, merely for the purpose of illustrating the loss and lack of efficiency, caused by an infection easily curable, except in the late stages, which is so frequently neglected and unrecognized and which, it must be apparent, might seriously impair the efficiency of the soldier, a man in whom the highest possible degree of efficiency is not only of vast importance but is of absolute necessity.

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A report of the examination of 3,773 men, composing a regiment of infantry and a machine gun battalion, would be of interest to the profession at large, but is of direct value to those of us especially interested in health conditions in the army.

My examination of the officers and men of the units mentioned impressed me primarily with two facts, first, and this is known to be true of the vast majority of diseases of a chronic nature, the wide variability of symptoms in a given number of cases. Many of those in whom was found both ova and worm presented, upon more or less critical examination, scarcely a recognized symptom of the disease at the time of examination. However, upon eliciting a careful history, an astonishing number of these were found to have been treated, at earlier periods of their lives, for various and sundry troubles. The greater number of these obscure cases gave a history of long periods of so-called dyspepsia and its apparent relief and inevitable relapses, but attended throughout with steady, although slowly progressing indisposition, lethargy, loss of energy, weight and ambition. At this time of examination and discovery of the ova or the worm itself, no outward sign existed to suggest its presence and, had it not been for a careful routine examination, would have progressed, no doubt, finally to a more classical picture of the familiar type, immediately suggesting the presence of the parasite.

The second fact, of more than ordinary interest to me, was that in cases of two or more members of the same family, brothers, under examination, the result was almost invariably the same, namely, that both, or in cases in which there were more than two, all were found to harbor the worm, or all were found to be negative. The family in which were found both positive and negative was the exception rather than the rule. On a larger scale, though with scarcely less variation, the same rule was found to hold good in cases of communities. An excellent opportunity for observation along this line was afforded me in several instances, where two companies were enlisted almost entirely from the same community, which presented results practically parallel. The most notable of these was in case of ———, two companies of infantry from which place were examined, one with total examined of 111. Total positive was 56 or 22.5 per cent; the other, total examined 226 total positive 52 or 23 per cent. Getting to a broader comparison, it is of interest to note that companies from adjoining counties of eastern Kentucky were found to show similar results, all of which leads us to the conclusion that here is a fertile field for work on hookworm eradication. This, however, may be a hasty conclusion in so far as specifying "a particular place" is concerned, for a routine examination of the

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inhabitants of other sections might result in the discovery of the exist ence there of the same condition.

It may be of interest here to note the method pursued in examining the men of the commands mentioned. A laboratory, after a fashion, was equipped and arranged in the regimental infirmary. Four men from the sanitary detachment were selected to prepare the specimens for examination. A letter was written to each company commander and forwarded to the commanding officer of the regiment, requesting that a roster of his company be submitted to me, and that certain instructions regarding the collection of specimens for examination for hookworm be followed carefully. These instructions were sent to him with a sufficient number of boxes to supply his command. The boxes were the ordinary sanitary paper spit cups. The memorandum specified first that each man be given a cup and instructed to write plainly his name and organization upon it, place a small quantity of feces (size of a hickory nut) in it, wrap it carefully and securely in paper, write his full name and organization on the outside and leave it at a place designated by the company commander; second, that he impress upon the minds of the men that these boxes were to be accounted for, used for no other purpose and not destroyed; third, that every effort possible to expedite this work be employed; fourth, that a sergeant be detailed in charge of the work, whose duty it would be to see that each man submitted, for examination, a specimen of his own feces, and that specimens were delivered to the laboratory at 7.00 a.m. promptly.

In the laboratory I instructed three of the men to prepare slides and the fourth to clean them after I had examined them. Not having a centrifuge was a handicap, but having three men at work reduced it somewhat. A small amount of feces was placed in a large test tube, one-third full of water, and shaken until thoroughly emulsified; the tube was then placed in a rack and the sediment allowed to fall, when the more fluid portion was poured off and a large drop of the sediment placed upon the slide. This was spread out to a thin film and was then ready for examination under the microscope, low power being used. After examining the specimen, its corresponding name on the roster was checked and marked either "positive" or "negative," as the case might be. After completing the examination of the command, a list of men who had been marked "positive" was prepared and delivered to the regimental surgeon.

Treatment not yet having been instituted, I am not in a position to enter that phase of the subject, nor report any results obtained.

The tabulated report of examination which includes both the —

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Infantry and — Machine Gun Battalion, — Division, U. S. A. is epitomized as follows:

	— *Inf.*	— *M. G. Batt.*
Strength of command	3,417	531
Examined, positive	624	35
Examined, negative	2,672	442
Total examined	3,296	477
Absent from command	69	37
Total accounted for	3,365	514
Unaccounted for	52	17
Total	3,417	531

A SURVEY FOR UNCINARIA AMERICANA

Made in pursuance to instructions from the Surgeon General, of all men from the southern states, in the various commands at ——, has been completed. In view of the findings a report on the work accomplished may be of some value for future similar studies.

Figuring an estimate of 5,000 men to be examined, a tentative scheme was outlined and the necessary supplies were ordered. As these were received they were conserved so that before any actual work was attempted all the necessary apparatus was at hand. This included microscopes, centrifuge, slides, cover slips, labels, centrifuge tubes, sputum and lily cups, wooden spatulas, applicators, wax pencils and office supplies. It was planned to keep six microscopes busy in an attempt to average about 100 specimens a day for each scope. This was found to be possible after the men had been trained.

The preparation of lists of the men to be examined from certain specified states which included Georgia, Florida, etc., was the next step. This was carried out by the company commanders who furnished us with the name, rank, organization and state of each man in their command. The survey prepared duplicate lists by companies, giving each name a serial number—in all, 8,277.

With the exception of the collection of specimens the entire work was carried out by a detail of fourteen privates and one sergeant, who had had previous laboratory training, under the direction of one of us in charge. This detail consisted of intelligent men secured from a base hospital unit in training at this post. To them much credit is due for their adherance to routine and exactness in carrying out the work as outlined. The first day or two was spent in familiarizing the men with

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length from 1 to 4 inches and show a marked tendency to stop at the epiphyseal lines.

Penetrating (Fig. 4) and *perforating* (Fig. 5) incomplete fractures are caused by small shell fragments, in the one case lodging in the marrow, in the other passing entirely through the shaft. In both, longitudinal fissures are apt to occur. Of the two, penetration is much more common. In fact, so great is the striking force required that perforation of the diaphysis without a complete fracture is rather rare. Occasionally one meets with a superficial perforation, resembling a very deep groove except for the lateral extrusion of a thin fragment of cortex, which juts in hinge-like fashion into the soft tissues (Fig. 6). In common with deep grooves, penetration and perforation are the most severe of the incomplete fractures, in that they expose the bone marrow to infection.

Complete Fractures.—These are produced in four ways—by the contact with, penetration or perforation of, the bone shaft by the smaller missiles, or by the smashing blows of the larger missiles. They occur either at the point of impact or at a distance of several inches, and, accordingly, they may be designated as direct or indirect.

The so-called contact fractures may be caused by missiles of a low or high velocity. In the former case the missile is impacted against the cortex or glances off it; in the latter case it perforates the limb, grooving the cortex in transit. The low-velocity missiles have been, in my own experience, of the following order of frequency: shell fragments (by far the most frequent), shrapnel balls (intact or split), the core or casing of disintegrated bullets, and deflected or spent bullets. Of the high-velocity missiles, the bullet has been the most frequent, then the shrapnel ball and shell fragment. Fractures from contact are the simplest of the complete fractures. They are characterized by the simplicity and fewness of fissures and by little loss of substance. Their fragments are large, with pointed extremities and usually adherent. The periosteum may be intact, save at the point of contact, or split along the lines of fissure. These fractures may be divided into three main types: (*a*) the transverse and oblique, or two-fragment fractures; (*b*) the "wedge-shaped," or three-fragment fractures; and (*c*) the "butterfly" or four fragment fractures.

(*a*) *Transverse and Oblique Fractures* (Figs. 7, 8, 9) are quite similar to those seen in civil practice. They are characterized by a single fissure and no extruded fragments. In number they are the least frequent of the direct fractures, occurring only occasionally in the larger bones, rarely in the smaller. They are caused generally by a missile which strikes a glancing blow, gouging a well-defined groove in the cortex. Less frequently they may arise from a direct impact.

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was set aside for this work alone. The work began at one end of the room and was completed by successive stages at the scopes at the other end. Each specimen box was received, labelled with its proper number; a small piece of feces was transferred, agitated with distilled water in a centrifuge tube, and the number marked with a wax pencil. The tube was centrifuged for 15 seconds at 1,500 revolutions and the supernatant liquid poured off. Spreads were made on to slides and cover slips placed on the drop. The latter were used to avoid drying. The slides were numbered with a wax pencil. The preparations were examined and, where positive, were so noted by the number on the slides. When negative, the slides were carefully gone over, the average time consumed being about five minutes. For the first few days all positives were checked and all negative slides examined by the officer in charge. After this it was found that the work of the men could be relied upon, frequent checking proving this to be correct. Mechanical stages were used on the scopes and microlamps for illumination; the latter were an invaluable aid, allowing the work to progress steadily in spite of dark days. One man remained in charge of records during the entire time. Twice a day the slips were checked on to the retained lists and at the end of each day the positives were forwarded by letter to the regimental surgeons with recommendations for treatment. Oil of chenopodium, followed by a purgative on three successive days, was carried out in all cases, with a request for another specimen of feces at the end of three weeks. The record of treatment was returned by letter to the survey, thus affording a check. Where the treatment could not be carried out because of transfer or other reason, every effort was made to reach the man and have this given.

All types of eggs were seen, from the first stages of granular protoplasm through to the formation of the larva within the egg. The latter were very rare, the usual form being the segmented type with an average of 7 or 8 divisions. The oval form was constant, they were often found round; this shape was due to position and could be altered to the oval by putting pressure on the cover slip. Many larvae were found moving in the free state.

Results.—8,277 names of soldiers were furnished to the survey, who had resided in southern states. From this number 6,159 specimens were collected. The failure to collect the exact number was due to many reasons, as transfer, leaves and illness. 1,504, or 24.4 per cent, were found positive for hookworm.

The number of men examined in the different units varied from 1 to 601 and the percentage positive from 0 to 44.1 per cent. The highest, occurring in one of the ambulance companies, had a total examined of

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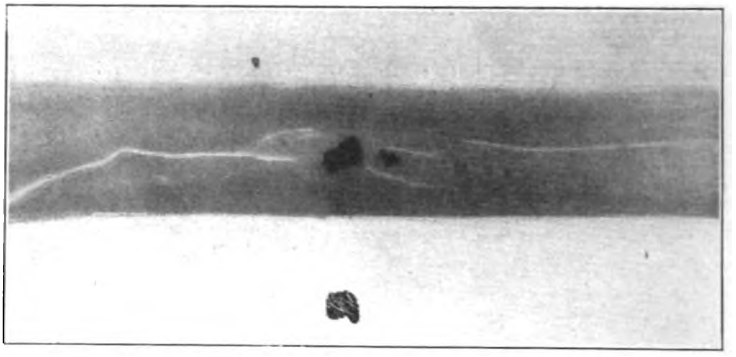

FIG. 3.—OBLIQUE COMPLETE FRACTURE OF FEMUR, ILLUSTRATING THE GREAT LENGTH OF FISSURES.

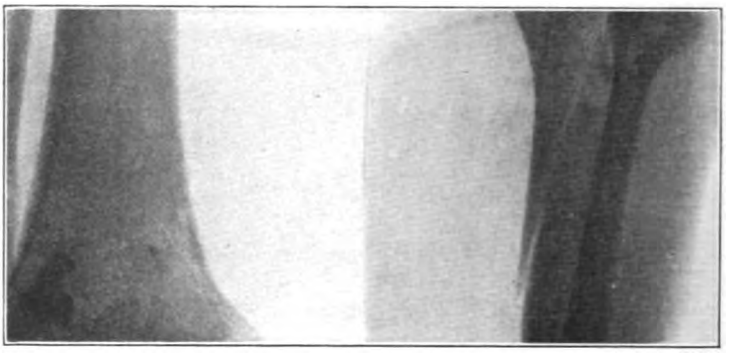

FIG. 4.—INCOMPLETE PENETRATING FRACTURE HEAD OF TIBIA, WITH FORMATION OF SINGLE LONG FISSURE.

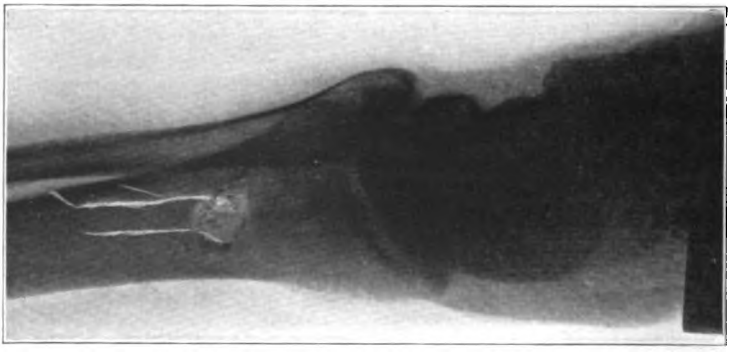

FIG. 5.—INCOMPLETE PERFORATING FRACTURE TIBIA, WITH SLIGHT FISSURING.

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FIG. 6.—DEEP GROOVED FRACTURE TIBIA. PRACTICALLY A SUPERFICIAL PERFORATION.
Note thin layer of cortex bridging the gap; also the area of osteomyelitis above.

FIG. 7.—DIAGRAM OF TYPES OF COMPLETE CONTACT FRACTURES.
1. "Butterfly." 2. "Wedge-shaped," from eccentric contact. 3. "Wedge-shaped," from direct central contact. 4. Oblique. 5. "Butterfly," with subdivision of lateral fragments by short fissures.

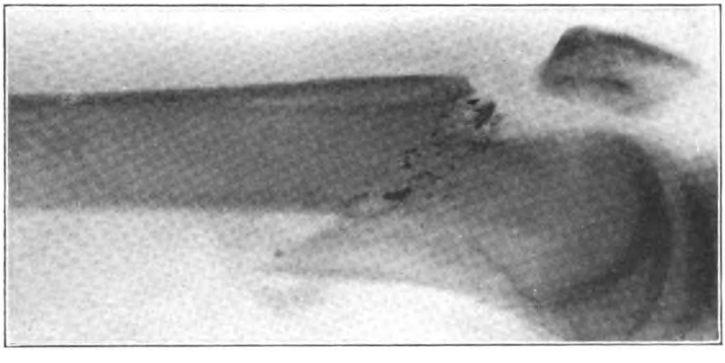

FIG. 8.—OBLIQUE FRACTURE OF FEMUR, DIRECT.
Note that tip of lower fragment is pointed, while that of upper fragment is blunted by the grooving of the missile.

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FIG. 9.—COMPOUND FRACTURE HUMERUS. OBLIQUE, WITH TENDENCY TOWARD "WEDGE-SHAPED" TYPE. THIS CASE HAD AN INDIRECT TRANSVERSE FRACTURE 3 INCHES LOWER.

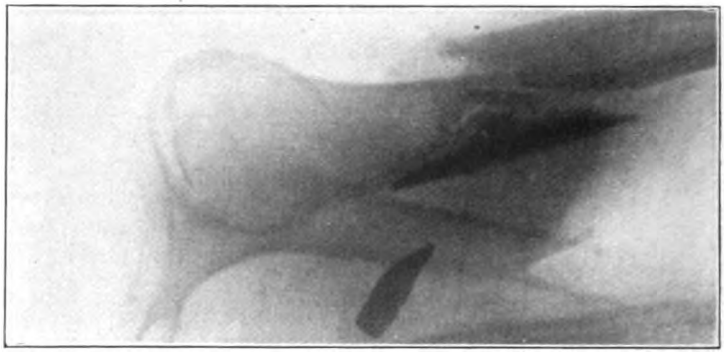

FIG. 10.—"WEDGE-SHAPED" CONTACT FRACTURE HUMERUS FROM DEFORMED, DEFLECTED BULLET.

FIG. 11.—COMPOUND FRACTURE TIBIA. PENETRATING SHELL. BONE CAVITY FILLED WITH "BIPP." ILLUSTRATES "BUTTERFLY" TENDENCY OF FISSURES.

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FIG. 12.—COMPLETE CONTACT FRACTURE OF ULNA, OF "BUTTERFLY" TYPE.

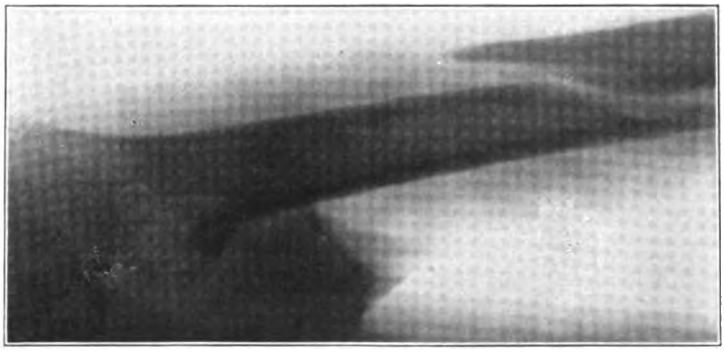

FIG. 13.—INCOMPLETE GROOVED FRACTURE OF UPPER THIRD OF HUMERUS. OBLIQUE INDIRECT FRACTURE OF MIDDLE THIRD.

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The upper and lower fragments have pointed extremities with no loss of substance save at the site of the groove where the fissure starts. All indirect fractures are transverse or oblique.

(*b*) The "wedge-shaped" fractures (Figs. 7, 10) are the result, as a rule, of eccentric or glancing blows, with grooving of the cortex. From the point of contact, fissures extend obliquely upward and downward around the farther aspect of the shaft until they merge into the longitudinal fissure of the opposite side. In this way a wedge-shaped fragment is separated laterally. The completion of the fracture is produced in one of two ways: if the blow has been glancing, by the resulting groove; or if more central and direct, by a fissure which extends from the point of impact obliquely or transversely about the nearer side of the shaft, merging with the longitudinal fissure. Thus three fragments are produced, an upper, lower, and lateral. Pointed extremities, adherent periosteum and little loss of substance are characteristic of them.

(*c*) "Butterfly" fractures (Figs. 7, 11) are produced by the direct impact of a low-velocity missile. From the contact point four fissures extend obliquely upward and downward and about both sides of the shaft, merging with the longitudinal fissure behind. A complete fracture results with the lateral extrusion of two wedge-shaped fragments (Fig. 12). Thus four fragments are formed, an upper and lower, both V-shaped, and two lateral.

As already indicated, these are merely the main types of contact fractures. The transverse and oblique, when they occur, are of course of a perfect type. It does not often happen, however, that a missile strikes with just the required force and at the proper angle to produce "wedge-shaped" or "butterfly" fractures of perfect type. Usually the striking force is excessive, with the result that the lateral fragments are subdivided by accessory oblique or transverse fissures. Never, however, do they approach the stage of comminution. In the worst of contact fractures the tendency toward one of the two latter types can be easily distinguished.

Penetrating and perforating complete fractures differ from the contact fractures not so much in the direction in which the main fissures extend as in the greater degree of fragmentation, the extrusion of nonadherent fragments, and the loss of bone substance. They are lesions produced by missiles of a greater striking power and naturally are more severe.

Of the two, the penetrating fractures are the less extensive. With the smaller missiles, such as shell or grenade fragments and disintegrated shrapnel or bullets, the bone lesion may be typically "wedge-shaped" or "butterfly," differing from the contact types merely in the

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fact that the cortex at the site of impaction is "punched in" over an area roughly of the size of the contact surface of the missile and is lodged together with the missile in the bone marrow. Spent bullets, directly penetrating with their sharp points and acting as wedges, may produce perfect "butterfly" fractures. With larger missiles, however, the bone is comminuted. Many of the smaller bone fragments are non-adherent, stripped of their periosteum, and ultimately necrose in the presence of infection, with varying degrees of loss of substance as a result. The common X-ray picture of such a fracture is that of a smash, the projectile lying in the midst of a mass of irregular fragments. In a few a tendency to conform to the two latter contact types is evident; in others it cannot be detected.

Complete perforating fractures exhibit, as a rule, the greatest amount of comminution and loss of substance of all fractures. The degree of comminution is dependent upon two factors, namely, the size of the bone shaft and the striking force of the missile. The greater the diameter of the bone, given missiles of equal striking power, the larger and fewer will be the fissures and, consequently, the larger, fewer and more adherent the fragments. The greater the striking force of the missile, given bones of equal size, the shorter and more numerous will be the lines of fissure, hence the smaller, more numerous and less adherent the fragments. It follows that as the striking power of missiles increases, the focus of fracture becomes more localized, with greater degree of comminution. In any given fracture, where the focus is not actually swept away, the progressive increase in the size of the fragments, as their distance from the track of the missile becomes greater, is readily distinguished. Thus along the track bone-dust will be found, and as one examines the fragments farther away they will be found to increase in size, becoming largest at the periphery of the focus.

With missiles of the minimum requisite striking force, perforation fractures may grossly resemble, as regards lines of fissure, the "wedge-shaped" and "butterfly" contact fractures. The missile does not perforate the shaft by pushing aside the bone substance with a wedge-like action, but drives the bone before it, more in the fashion of a punch. The orifice is rounded, approximately of the size of the missile, while the exit is larger, produced not only by the missile but by the bone from the orifice which has been set in motion as a secondary projectile. The exit is generally demarcated by fissures which give it roughly a quadrangular or triangular shape.

As the missiles increase in velocity, the fractures become more irregular, with greater comminution. More of the bone is carried away as

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secondary projectiles. These tend to diverge and, if of sufficient velocity, help form the explosive exit wounds of the soft parts. They may even perforate the skin at some distance from the exit wound of the missile. Occasionally, in the smaller bones of leg and forearm, the whole focus is swept away, leaving a definite gap in the bone shaft (Fig. A).

Those fractures, caused by very large shell fragments and grenades bursting close at hand, follow no type. They are merely severe smashes, with excessive shattering of the bone-shaft and severe laceration of the soft parts. Early amputation is their usual fate.

Indirect Fractures.—These differ from the direct in being caused, not by the impact of the missile, but by the sudden violent pressure exerted upon the shaft. They occur at distances of 2 to 6 inches from the wound and are essentially simple. As already indicated, they are either transverse or oblique. Three types may be observed. In the first and more usual, the indirect fracture occurs in the same bone as the direct, and distal to it. There have been at least three such cases at this hospital, all of them occurring in the humerus, the direct fracture being in the upper third, the indirect in the lower half (Fig. 23). The second type may be seen in forearm and leg fractures, consisting of the direct fracture of one of the bones, generally tibia or radius, with indirect fracture of the other bone. The third type is not often seen. It consists of a direct fracture of forearm or leg with an indirect fracture of arm or thigh. There has been one case of this nature here—a direct fracture of the tibia and fibula with an oblique indirect fracture through the supracondylar portion of the femur.

Ballistics.—There is no intention of considering in detail the question of ballistics, but merely of touching upon it in its relation to the causation of the different types of fractures. The missiles with which we are concerned may be divided into two main groups: (1) the primary, such as bullets, shrapnel balls and fragments of shell or bomb; (2) the secondary, such as fragments of wood, stone or metal which are put into motion by shell or bomb explosions.

The modern bullet is an elongated missile, ogival or conico-cylindrical in shape, with sharp or rounded nose, weighing 10 to 15 gms. Its caliber is roughly one-quarter of its length (7 m.m. : 30 m.m.). Its metal may be homogeneous throughout, such as the brass French bullet D, or may be composed of a hardened lead core surrounded completely by an envelope of steel, nickel or copper in various combinations. Its initial velocity, or the distance it would travel in one second if unaffected by air resistance, ranges from 570 to 860 meters. Its remaining velocity gradually diminishes from air resistance and may be stated as follows, taking the French D bullet as an example: at 400 m., r.v.=

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536 m.; at 600 m., r.v.=470 m.; at 1,000 m., r.v.=365 m.; at 2,000 m., r.v.=210 m. The range is about 3 kilometers (1). In the course of its flight the bullet tends to turn upon its long axis in spite of the rotation imparted to it by the grooves of the rifle barrel. This is due probably to air pressure exerted upon a missile rendered unstable by having its center of gravity somewhat behind the mid-point of its axis. The deflection may amount to a third in 600 meters, with the result that the missile may strike sideways or base first. The bullet is also liable to deflection by ricochet. It is stated by Delorme[1] that one-third of all wounds are caused by ricochetting bullets. These bullets may also be deformed or disintegrated. Delorme quotes Journée in the statement that a velocity of 750 meters is necessary for deforming a jacketted bullet.

Shrapnel balls are rounded, made of hardened lead; diameter 10 to 16 mm., weight 10 to 12 gms. They are contained in shell cases, to the number of 200 to 350. The bursting charge is placed mostly at the base of the shell, so that on exploding the shrapnel balls are propelled forward at an increased velocity, dispersing in cone-shaped fashion. Three-inch field-gun shrapnel at a range of 6,500 yards has an initial velocity of 865 feet per second: the sum of the remaining velocity of the shell (565 f.s.) and the increased velocity conferred by the bursting charge (300 f.s.). At 3,000 yards the area of dispersion is about 400 yards in length and 150 yards in width, with a central zone, 25 yards in diameter, in which the velocity is at its maximum (2).

Shell fragments are derived from the disintegration of shell cases by explosion into hundreds of small fragments, weighing 5 to 300 gms. Very large fragments are derived from the base, fuse or ogive. The velocity of the fragment is roughly that of the shell: at 1,000 m., 422 m.; at 2,000 m., 346 m.; at 3,000 m., 300 m.[1] Two types of shell are used: (*a*) those bursting in the air by time-fuse, for the destruction of men; (*b*) those bursting by percussion, for destruction of men and material. Taking a 3-inch time-fuse shell as an example, the fragments will number about 600, with an area of dispersion about three-quarters that of shrapnel.[2] Percussion shells are most deadly in the immediate vicinity of their explosion, not only from their own fragments but from the secondary projectiles which are set in motion. The area of dispersion of shell fragments, as well as shrapnel, will vary with the bursting height. The lower the shell bursts the smaller will be the area of dispersion and the greater the velocity.

Bomb fragments resemble those of percussion shells in their localized zone of action. They are as a rule smaller. Their velocity is great close at hand, but diminishes rapidly. Secondary projectiles likewise rapidly

[1]Delorme: War Surgery, 1915.
[2]L.aGarde: Gunshot Injuries, 1914.

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lose their velocity, though the initial velocity may be great enough to cause severe injury.

Missiles may be said to have an active power and a penetrative power. Their active power is dependent upon two factors, weight and velocity. The equation of active power is expressed thus: $P=\frac{WV^2}{2}$ (Delorme). It follows that the missiles with the greatest velocity and weight will have the greatest striking power. Their penetrative power depends not only upon their striking power, but also upon the resistance of the tissues. It is at once evident that, given missiles of equal weight and velocity, the tissues will offer most resistance to that missile which presents the largest striking surface; in other words, the largest caliber. That missile will have the least penetrating power. It is this latter power which determines the destructive action of a missile upon bone.

Holding in mind these factors of penetrative power, it becomes evident that the undeflected bullet is the most destructive of the smaller missiles. Its velocity is greater at all distances. Its active force, according to Delorme, may be expressed in kilogrammeters as follows: at initial velocity, a.p.—330 kgm.; at 100 m., a.p.—230 kgm.; at 300 m., a.p.—145 kgm.; at 500 m., a.p.—95 kgm.; at 1,000 m., a.p.—55 kgm.; at 2,000 m., a.p.—25 kgm. Its caliber is small, thus enhancing its penetrative power. It has been estimated by Laurent[3] that the following active powers are necessary for certain degrees of injury: for traversing 4 to 7 men, 304 kgm.; for traversing 3 to 6 men, 176 kgm.; for explosive effects, 128 kgm.; for fracture, 16 kgm.; for disabling a man, 8 kgm.; for contusion, 2 kgm. These figures apply to undeflected bullets. In accordance with these effects, three zones of action have been designated: (*a*) the explosive zone, within the first 500 m. of the trajectory, in which the bullet exerts the maximum power, having a divulsive and propulsive effect upon the tissues; (*b*) the zone of perforation, at a range of 500 to 2,000 m., in which the bullet acts as a wedge, dividing the tissues without explosive effect; (*c*) the zone of contusion, at a range of over 2,000 m., in which the active power is at its minimum, resulting in only slight injuries.

Deflected bullets, though they may have the same active power, have a lesser penetrative power than the undeflected, in that they present a larger surface to the resistance of the tissues. Likewise shrapnel and shell fragments of equal weight have less power of penetration than bullets. Not only is their initial velocity less, but their caliber may be greater. Their velocity moreover, diminishes so rapidly that at the periphery of the zone of dispersion their effects are far removed from those of bullets. The larger shell fragments, at the beginning of their

[3]Laurent: La Guerre en Bulgarie et en Turquie, 1914.

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flight and in the center of the dispersion zone, have an excessive active power, dependent upon their preponderance in weight. Their penetrative power, though diminished by their large caliber, is yet sufficient to enable them to produce severe lacerations. Grenade fragments, being small and quickly losing their velocity, have little penetrative effect at a distance. Close at hand, from their multiplicity and closeness to each other, they may have severe disruptive effects. The secondary projectiles are the least penetrative of all missiles, in that they have a comparatively low initial velocity and a large caliber. Close at hand, if of excessive weight, they may have severe lacerating effects.

Keeping clearly in mind these varying penetrative powers, the causation of the different bone injuries may be deduced. Undeflected bullets, in the explosive zone, will produce severely comminuted complete fractures, with propulsion of fragments and explosive exit wounds, if they strike the bone shaft directly; grooves, with complete contact fractures, if they strike glancing blows—the more glancing the blow, the less comminuted the fracture; and contusions, from grazing or vibration, when passing through the adjacent soft tissues. In the zone of perforation they may cause complete comminuted fractures without propulsion of fragments, complete perforating fractures with little comminution, resembling the "butterfly" type, or incomplete perforating fractures with longitudinal fissures—when striking directly; complete fractures of the "wedge-shaped" type, when striking a glancing blow; simple grooves and contusions. In the zone of contusion they may cause complete or incomplete penetrating fractures when striking directly; grooves and contusions when striking eccentrically.

Deflected bullets in the explosive zone will produce excessively comminuted fractures with severe laceration of the soft parts; in the perforation zone, contact fractures with considerable comminution and laceration at the nearer ranges, diminishing rapidly with increasing range; in the contusion zone, grooves and contusions.

Shrapnel balls and the smaller shell fragments, in the center of their dispersion zone, may produce severe comminutions with moderate propulsion of fragments, when striking directly; grooves with complete contact fractures when striking glancing blows; simple grooves and contusions. The very small shell fragments may penetrate or perforate the bone without complete fracture. In the outer portions of the zone, they produce complete contact fractures, both penetrating and perforating, incomplete penetrating fractures, grooves and contusions. The larger shell fragments, in the central zone, produce severely comminuted fractures, with excessive laceration of the soft parts. In the outer areas of dispersion, they produce complete contact fractures, with laceration, or contusions.

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Grenade fragments, close at hand, may cause extensive comminution and severe laceration. At a distance they produce incomplete penetrating fractures, grooves and contusions. The secondary projectiles, at short range, produce effects similar to those of shell fragments. At a distance they cause only slight contact fractures, grooves or contusions.

The treatment of compound gunshot fractures resolves itself into the supression of infection, the postural treatment of the fractured bone and the prevention or rectification of complications.

The infection of compound fractures is of course more complicated than that of ordinary flesh wounds. It is a combination of infection of the soft tissues and of bone. That of the soft tissues, though primarily it may be most severe, is as a rule quickly subdued. In the bone it is more resistant, leading frequently to successive re-infection of the soft tissues. It is the infection of the soft tissues that immediately endangers life. It is the bone infection that, through chronic suppuration and constant re-infection, subsequently endangers life. The treatment of infection of the soft parts is often the chief initial problem, for not only is life endangered but no adequate postural treatment of the bone can be carried out until the swelling and pain have been relieved.

Nature of Infection.—In every wound infection a definite evolution is evident. From the clinical aspect, three stages will be observed—the pre-inflammatory, the inflammatory, and the suppurative. The pre-inflammatory stage extends through a period of 12 to 48 hours after reception of the wound—during which there is no discharge; the adjacent tissues have neither swelling nor redness and there is no temperature. Then begins the inflammatory stage, continuing for 2 to 3 weeks—during which the wound discharges freely, the adjacent tissues are swollen, reddened and painful, and the temperature is raised. The wound discharge undergoes a definite change. It is at first reddish-brown, thin and foul, suggestive of broken-down blood-clot. As time passes it gradually becomes whiter, thicker and less foul and finally frankly purulent. The soft tissues likewise change their aspect, gradually losing their inflammatory signs as the discharge becomes purulent. The suppurative stage has begun and continues until the infection is cured. The discharge remains purulent. The infection of the soft tissues becomes localized to the track of the missile constituting a definite sinus to the site of the fracture.

From the bacteriological aspect, wound infections may be divided into four stages. There is first the quiescent stage, corresponding to the pre-inflammatory, during which the bacteria, both anaerobes and aerobes, exist only in patches along the track of the missile and about any foreign bodies that are lodged there. They are not in sufficient

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amount to cause inflammatory reaction. From about the second day until the end of the first week, the discharge begins to increase, reddish-brown and foul. In it the spore-bearing anaerobes and streptococci predominate. From the end of the first week until the end of the third, a period of transition exists in which the anaerobes gradually decrease and the pyogenic organisms relatively increase. After the third week the discharge is frankly purulent with the predominance of streptococci, staphylococci, coliform bacilli, etc., and only a few anaerobes[4].

There are several factors which influence the nature and degree of infection. The chief external factor is the high impregnation of the soil with fecal organisms. Consequently skin, clothing and missiles may become contaminated. Of twelve samples of clothing examined by Fleming,[4] ten contained *B. aerogenes capsulatus*, four contained *B. tetani*, five contained streptococci, and two staphylococci. It follows that the wound may be infected by missiles which have been contaminated by skin, clothing, or, in the case of ricochet, by soil; by particles of clothing that have been carried into the wound; by secondary projectiles, or by extension inwards from skin or clothing. The chief internal factor in infection is the degree of laceration of the tissues. It may be considered a maxim that the degree of infection is directly proportional to the degree of laceration. With extensive wounds there is always destruction of muscle and fascia, and the combination of necrotic tissue, blood-clot and infected foreign bodies affords a most favorable medium for the growth of infection. Taylor[5] has proven experimentally that the implantation of cloth infected with aerobic and anaerobic organisms results in a more extensive infection than the implantation of the organisms alone; that the substitution of dead muscle for cloth causes an even more extensive infection; and that the combination of dead muscle and cloth gives rise to the most severe infection of all.

Holding in mind these factors, it is easy to determine the part which the missile plays in the infection. The undeflected bullet of reduced velocity is the least likely to introduce infection. It has had no previous contact with the soil. It does not carry the clothing along with it. It causes small skin wounds and, in accordance with its lack of explosive power and the moderate degree of the fractures produced, but little laceration of muscle and fascia. Shrapnel, shell and grenade fragments, and secondary projectiles of reduced velocity, will as a rule introduce a certain amount of infection, in that they tend to punch out particles of clothing and carry them into the wound, and moreover, with the exception of shrapnel, may have had contact with the

[4]Fleming: *The Lancet*, September 18, 1915.
[5]Taylor: *Annals of Surgery*, December, 1916.

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ground; but this infection will not ordinarily be of intense nature, as there is but slight laceration. It tends to be limited to the tissues in immediate proximity to the track of the missile. Undeflected bullets of high velocity may produce badly lacerated wounds which will become severely infected from skin and clothing. Likewise, ricochet bullets, shrapnel and the various fragments, when of high velocity, may produce severely infected wounds from the combination of laceration, contamination from the soil and introduction of clothing.

As already indicated, the usual evolution of wound infection is toward the pyogenic stage. The simplest type of pyogenic infection is manifested in wounds of slight laceration with small skin apertures. There is a slight adjacent inflammatory reaction and only a moderate discharge of pus. Often the skin wounds heal, resulting in a localized abscess. With increasing degrees of laceration, the infection becomes more severe, extending along the numerous clefts that are opened, and involving the adjacent tissues in more and more severe phlegmonous inflammation with glandular reactions and constitutional symptoms. Such infections are generally amenable to treatment and do not constitute a serious menace to life.

Under suitable conditions, however, the anaerobic organisms which, as already shown, predominate in the early stages of infection, may gain the ascendency and produce infections which immediately endanger life. The conditions which favor most their onset may be summarized as follows: the retention of bloodclot and wound discharges, the presence of devitalized or necrotic muscle and fascia, extensive comminution of bone, prolonged contact with the wound of blood-soaked dressings or clothing, and interference with circulation by injury of blood vessels or constricting bandages. Thus there is provided an ideal medium under anaerobic conditions, in tissues whose vitality is lowered by shock and by a diminished blood supply. The resultant infections are of two types: those arising (*a*) from gas-producing organisms, and (*b*) from the bacilli of tetanus.

Gas Infection.—The malignancy of gas infections, in common with those of pyogenic origin, is inversely proportional to the degree of localization. There are three types which are well localized, quickly amenable to treatment and devoid of severe constitutional effects. The first of these occurs generally in a punctured wound. It is manifested by a scanty, foul, brownish discharge, bubbling with gas, and by a restricted area of cellulitis as evidenced by subcutaneous crepitation. The second takes the form of a gas abscess, developing about a lodged foreign body, with a closed skin wound. The third type is localized to a muscle or small group of muscles, such as the anterior tibials or peroneals. Gas infection does not tend to spread from in-

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jured to uninjured and healthy muscles. Hence the infections of this type remain localized and are easily treated.

The more severe types may develop in either muscles or subcutaneous tissues, or in both. They are much more extensive, more progressive, and produce menacing constitutional effects. The first of these may be termed a gaseous cellulitis. There is an extensive, rapidly progressing involvement of the subcutaneous tissues. They become swollen and tense, crackling on pressure, and on section exude lymph-like fluid and gas. If arising in the proximal segments of the extremities, this infection may rapidly involve the trunk, in spite of treatment, with resultant blood infection and death. A more severe type occurs in the larger groups of muscles, such as those of thigh or calf, which have been extensively lacerated. The area involved becomes swollen, tense and possibly tympanitic. Pain is at first severe, referred to the muscles involved, but as they necrose it dies away. The infection may extend along the vascular sheaths and outwards to the subcutaneous tissues. If the muscles are in a position to exert pressure upon an important blood vessel, it may be occluded, with necrosis of the area it supplies and extension of the infection thither. In this way, by occlusion of the femoral or brachial arteries, massive gangrene of the distal segments may result.

The most malignant of all gaseous infections is that which produces massive gangrene of the extremities. It is associated with severe muscle laceration and is due to interference with the circulation, either from primary injury to the blood vessels or from their occlusion by increasing gaseous pressure. It generally develops in two or three days after injury, but, on the other hand, may occur within a few hours or only after several days. Within ten hours it may progress to a fatal conclusion. It is a common experience for a limb to be transformed over night from a condition of apparent health to a state of advanced gangrene, with fulminating general symptoms. Two types of massive gangrene are observed, dependent upon the precedence of either the local signs and symptoms or of the constitutional. In one type the general symptoms precede the local. Rapid toxaemia develops, leading to a fatal conclusion before the limb has become gangrenous. Nausea and vomiting begin; the pulse becomes rapid and of low tension; the skin is cold and moist. There may be a sense of well-being until death; or if in the terminal stages pain develops in the swelling limb, the mental state may become that of muttering delirium. In the other type the local symptoms precede the general. Severe pain sets in. The limb becomes swollen, tense and tympanitic. Subcutaneous crepitation is usually a late development. The pulse in the extremity is gradually obliterated. The skin becomes purple, then dark green and

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black, and may be the site of extensive bleb formation. As the gangrene advances, the limb becomes cold and numb, and the pain ceases. General symptoms supervene. In some cases these are restlessness, delirium and unconsciousness; in others the mental faculties remain unclouded and there is a sense of well-being until death. The pulse becomes rapid and feeble; the skin, "clammy"; the respirations increase; the temperature is often sub-normal, particularly as dissolution becomes imminent; rarely is it much raised. The blood may become infected, with the development of gas bubbles, leading to cardiac churning and distress. The abdomen may become distended, with onset of vomiting and hiccoughing. High leucocytosis, decreased alkalinity of the blood and haemolysis have been reported. Death results from cardiac failure or gas embolism. At post-mortem examinations degeneration of the cells of the brain cortex, liver and adrenals and intestinal hemorrhages have been found.

Tetanus.—The nature and course of tetanus is much the same as in civil practice. In contrast to gaseous infections, it may develop in the most innocent-looking wounds and is not dependent upon severe lacerations. On the other hand, it may be exacerbated by a severe concomitant pyogenic or gaseous infection. The type with generalized symptoms is common; in addition there are many cases with only a slight trismus or tetanic spasms localized to a muscle or group of muscles. The mortality has undergone a marked reduction since the beginning of the war. Of 179 cases reported in the British overseas forces up to July, 1915, the mortality was 78.2 per cent.[6] Of 231 cases occurring in home hospitals from August, 1914, to July, 1915, the mortality was 57.7 per cent.[7] Of 195 cases occurring from August, 1915, to July, 1916, the mortality was 49.2 per cent.[8] Of 200 cases from August to October, 1916, the mortality was 36.5 per cent.[9] Of 100 cases from October to December, 1916, the mortality was 31.0 per cent. Thus there has been a gradual decline of 47.2 per cent up to last December.

The rule that the shorter the incubation, the greater the mortality has obtained. Of the 195 cases last mentioned, those with incubation periods of ten days or less showed a mortality of 81.5 per cent; those of 11 to 25 days, 52.2 per cent; those of over 26 days, 27.2 per cent. In the last hundred cases reported, symptoms were distributed as follows: general, 61, with 34 per cent mortality; local, 28, no deaths; doubtful, 11, with 91 per cent dead. 35 infected fractures had 11.4 per cent and 65 infected flesh wounds, 41 per cent mortality.

(To be continued)

[6]Sloggett: Memorandum—Treatment of Injuries in War, July, 1915.
[7]Bruce: *British Medical Journal*, October 23, 1915.
[8]*Ibid., The Lancet*, December 2, 1916.
[9]*Ibid., The Lancet*, September 15, 1917.

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THE REACTION FOLLOWING THE USE OF ANTIPNEUMOCOCCIC SERUM

By Major ALFRED FRIEDLANDER and
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AFTER the use of antipneumococcic serum there is almost always a reaction—at times very profound. This reaction seems to have no relation to the curative properties of the serum. Good results are obtained in cases with both mild and severe reactions. Also, severe reactions occur in cases without remedial response.

The reaction is due to the introduction of the foreign proteid of the horse serum. The serum is not used, therefore, in cases with a history of asthma or where there is evidence of sensitization to horse serum.

To guard against sensitization, desensitizing doses of serum are always given before the first therapeutic dose. 0.5 cc. of the serum is injected either subcutaneously or intravenously; 30 minutes later 1 cc., 30 minutes later 2 cc., 30 minutes later 4 cc., the latter two times intravenously.

Only twice in our series of 200 cases have there been symptoms during the giving of the desensitizing doses. One patient had a slight nausea lasting for ten minutes after the 4 cc. dose. The other patient had an urticaria over a small area surrounding the site of the 2 cc. dose. In both cases the reaction following the therapeutic dose was very mild.

100 cc. of serum is the dose usually used. This is diluted with 100 to 150 cc. of normal salt solution, heated to slightly more than body temperature and injected slowly into the vein, the conducting tubes being warmed with hot-water bottles. It is the endeavor to inject the serum so slowly that half an hour will be consumed in the process.

The reaction that follows is never the same in any two patients, neither is it the same in the same patient when the serum is exhibited more than once. A patient having a severe reaction the first time may escape the reaction altogether on repeated doses, or may have a mild reaction or, again, one as severe as in the first instance. Some cases that have little or no reaction on the first dose will show most profound symptoms on the second. The interval of time between doses seems to have no bearing on the reaction with the second dose, although the longest period that has elapsed between doses is ninety-six hours.

The reactions following the use of antipneumococcus serum are so various that one can never be sure just what to expect. The reaction may begin as early as ten minutes after the serum of the final dose begins to enter the vein, or it may be delayed for some time after the

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treatment is over. One case showed no symptoms for an hour and ten minutes, when a severe reaction of the urticarial type developed. Another case on the second dose of serum, forty-eight hours after the first dose, at which time there had been an immediate and very severe chill associated with weak heart action, had another reaction that did not begin for ten hours after the administration of the serum. The patient then was slightly chilly for over half an hour and subsequently broke into a profuse perspiration that lasted about six hours. The pulse was noticeably weakened during the whole of the perspiration, but the shock was at no time profound. A third patient having had no symptoms following his dose of serum for six hours, except a mild dyspnea, suddenly become faint and had a weak heart action for a short time. These cases, however, were the only ones in which the reaction was delayed, the space of a half an hour usually being sufficient to develop symptoms if they are going to occur.

While the symptoms are always various, each case being a law unto itself, the typical reaction may be divided into four stages occurring in rapid succession and a series of secondary symptoms occurring some days later. The first stage may be termed the stage of irritability, the second the stage of shock, the third the stage of hyperpyrexia and the fourth the stage of relaxation. Any of these stages may be very lightly stressed or even absent entirely. If any of the syndrome be absent it is more apt to be the symptoms of shock. The third stage is not always well marked, although some hyperpyrexia is practically always present. Because the reaction starts mildly or severely it does not follow that the subsequent stages are going to develop as initiated.

The first stage may pass quickly in five or ten minutes, or it may last more than half an hour; usually twenty minutes suffice. It may begin either as a flushing of the face, a burning of the eyes, an itching of the skin or an irritation of the bronchial tubes. Most frequently after the first symptoms, the face will become flushed, even when the flushing does not usher in the performance. This flushing often proceeds to a deep crimson. The pulse becomes accelerated, full and bounding, the veins on the forehead distend and there is a slight moistness of the skin. If the eyes are involved, as they may be even when their disturbance is not an initial symptom, they will itch and burn, often becoming bloodshot and quite swollen. A few patients have complained that the eye symptoms were so severe as to blind them for a time. An itching skin is a very constant symptom. It may be slight or very pronounced. It comes either as the first symptom or as a sequel to the flushed superficial capillaries. Often there are wheals developed on the surface of the skin, like an urticaria. These hives may be few in number or may cover

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the whole body thickly. Occasionally they are no more than common "goose flesh," or they may be individually as much as 2 cm. wide and raised 2 to 3 mm. These wheals usually begin around the head and proceed down the body, fading off after a few moments in the same order. Those on the chest may not appear until after those on the face are gone, although the procession may be more synchronous and all be in evidence at the same time. When the bronchi are involved there is a peculiar dry explosive cough which sometimes comes in such paroxysms as to rack the patient's whole body. When this is one of the early symptoms, the sudden and spasmodic character of the movements causes danger of the needle, through which the serum is being given, being jerked from the vein.

Another bronchial involvement that may be associated with the first stage is dyspnea. The difficulty of breathing is usually mild and transient although in one case the dyspnea lasted for 24 hours, was very annoying, and was accompanied by a very definite asthmatic bronchial wheeze. The patient gave no history of asthma.

The itching skin, the burning eyes, the spasmodic cough, the difficult breathing, if any or all of them are present, naturally cause the patient to be very restless. This restlessness at times assumes a very marked character. The patient rolls in bed, tosses from side to side, and may even become delirious. The delirium usually confines itself to aberrancies of speech and is very transient in character. Some few patients attempt to escape. One man had a pronounced mania which lasted about an hour, beginning mildly and proceeding to such violence that it required five men to restrain him in bed.

The symptoms of the first stage, as above described, may be entirely absent and their place taken by a chill. When the symptoms of peripheral irritation are present a severe chill has never been noted, although the patient is often slightly chilly. On the other hand, when a marked chill supervenes it replaces all the other first stage symptoms, is usually very severe, lasting for as long as half an hour. This chill most frequently extends over the second stage, the symptoms of cardiac weakness being noted before the chill passes. As the chill leaves, the patient usually passes immediately into the third stage.

The first stage, as previously stated, presents a picture of an irritable, engorged, excited patient. It never occurs *in toto* as above described, one or the other groups of symptoms being emphasized or lacking, as the case may be. However, some one or more of the detailed symptoms usually marks this stage unmistakably. It has been noted that the different sera which have been used each has its predilection as to the type of first stage reaction. With one the urticaria is more often

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present, with another the chill is the more frequent response, with a third the delirium is more common. However, any type of first stage may be present with any brand of serum used.

The first stage generally blends gradually into the second, although symptoms of shock may come with great suddenness. In cases where there has been little or no first stage and the patient has gone along normally for half an hour or more it is with a feeling of great surprise that the physician suddenly realizes that his patient is in the midst of a severe shock. Usually, however, the pulse loses its fullness, takes on a weak and thready character and may even become irregular—this possibly to such an extent that the pulse cannot be detected at the wrist. The flushed face gives way to a cyanosis, the bluish tint usually appearing first on the lobes of the ears. This is accompanied by a marked pallor which is in striking contrast with the previous flush. The patient begins to perspire freely, the cold sweat at times coming out over the body in great beads, so that the bed is drenched and a complete change demanded. The chill of the perspiration extends to the whole body, the extremities often being markedly cold to the touch. As the character of the pulse changes the patient becomes less restless, the delirium ceases, and he lies quietly, occasionally sinking into unconsciousness, from which he may be roused in mild cases, but which in rare instances becomes most profound. A well-developed case of serum shock is a most alarming spectacle. Though we have never observed a case in which the symptoms did not respond to treatment, it can easily be imagined that such an instance might occur if the case did not receive close attention.

Frequently after the second stage has become well developed there is formed a quantity of putrid gas. This is belched up or passed per rectum. The intestinal involvement may cause nausea, even to vomiting, or may bring on a profuse, exceedingly foul action of the bowels. If the patient vomits or has a bowel action it immediately terminates the stage of shock, the pulse picks up, and the faintness disappears. If the intestinal disturbance does not supervene, the shock passes gradually, the heart taking up more and more normal action.

The second stage does not always develop. When it comes it is often very transitory, passing of itself in 3 to 4 minutes. In its severe form, however, it may be half an hour before the patient responds to treatment. Adrenalin hypodermically, in severe cases intravenously, seems to be a specific for serum shock. It should be given freely upon the first signs of failing heart action and repeated as often as every five minutes until the patient shows signs of reaction. No serum should ever be given without having a supply of adrenalin on hand and a hypodermic syringe ready for use.

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With the passing of the shock the patient gradually regains his tone and passes into the stage of hyperpyrexia. The pulse becomes full, the cyanosis disappears, and the face regains its slight flush. The cold drenching sweat is succeeded by a normal or slightly moist skin. The patient recovers from his collapse and is slightly restless. Within an hour or an hour and a half after the patient has received the treatment he usually has an elevation of temperature. This is the most constant symptom following the use of the serum, and it may be that the increase is due as much to the antitoxic properties as to the foreign proteid content of the serum. Although the rise in temperature is most constant it is not always pronounced and may easily be missed unless one be on the lookout for it. The ordinary elevation does not exceed a degree, though it is not uncommon to have the temperature go up to 106 or 106½ degrees. The stage of hyperpyrexia is often associated with a profuse perspiration; the break between the drenching cold sweat of the shock and the warm exudation of the fever can easily be overlooked. This stage is of varied length, often being over in half an hour, but at times lasting for an hour and rarely, longer.

Upon the recession of the temperature the patient enters upon the fourth stage and becomes relaxed. The pain is relieved, the restlessness passes, the temperature gradually falls, and the patient usually sinks into a peaceful sleep that lasts several hours. If awakened he will rouse, say that he is feeling more comfortable, and soon fall asleep again.

Six hours after the treatment, if the serum has accomplished its purpose and the toxemia of the pneumococcus is abated, the patient will have a normal, or much more nearly normal, temperature than before and, aside from the physical evidence in his lung, he often feels and appears perfectly well. Should the dose have been insufficient, or should the type of infection not correspond to the immunity conferred by the serum, the amelioration of the patient's symptoms will be little or none, even though the reaction through which he has gone has been severe.

The patient, when the reaction has been typically staged, has exhibited a surprising series of contrasts. First the flush, then the pallor and chill, succeeded by the extreme heat, and then the mild, peaceful sleep, in one who a short time before had presented the ordinary anxious, restless facies of pneumonia, give a moving picture in which the successive scenes are thrown on the screen with greater rapidity than is the custom with physiological reactions.

The day following the use of the serum there is an albuminuria which seems to be more marked than is the case with an ordinary pneumonia. However, since this symptom is so common in pneumonia

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it would take a long series of closely studied cases to tell whether the serum has increased the incidence or the severity above the ordinary. While the albumin content may be high (44) it is not usually persistent, being cleared up in a few days' time.

From three to fourteen days after the administration of the serum, secondary symptoms may arise in the shape of an eruption, which is usually urticarial in nature, although it may be herpetic. It is, as a rule, transient in character, lasting only a few hours; however, it may continue for several days. The eruption appears anywhere, on the face, trunk, extremities, palms of the hands or genitals. It causes intense itching and, when it lasts more than a few hours, is exceedingly disagreeable. In some of the cases the urticaria passes over the body in a wave, lasting not more than two hours in all and not more than thirty minutes in any one spot. There are seldom concomitant symptoms, though a few cases have had a fever of 100 associated with the eruption which could be assigned to no other cause. One of these cases had a series of further symptoms that were most out of the ordinary. The man entered with an exceedingly weak intermittant pulse, one lobe only being involved. The administration of the desensitizing dose caused a slight nausea, but neither the first dose of serum, nor the second, next day, was followed by a marked reaction. The heart action improved steadily under digitalis and the pneumonia rapidly receded by lysis. Ten days later there developed a marked urticaria that lasted for two days, the individual wheals being very large and permanent. During the second night the eruption suddenly left and a most intense hyperasthesia developed. The skin over the whole body was exceedingly sensitive, any touch, even of the bed clothes, being painful. Associated with this were marked arthritic symptoms. The joints of all the extremities were painful to even the slightest movement; there was a noticeable swelling of the hands which in one hand persisted for a day. Accompanying these symptoms there was a temperature that at its height was 100.5°, but which gradually fell during the day, being normal next day. The following morning the skin sensitiveness had departed; the joint symptoms were only faintly noticeable, except for the continued swelling of one hand. The urticaria, however, had reappeared in a mild form on the feet and legs. These wheals faded during the day, and ninety-six hours after the first symptoms of secondary reaction the syndrome had completed its cycle.

The antipneumococcic serum reaction is an exceedingly interesting set of symptoms which may undoubtedly be classed with that vast multitude of phenomena due to foreign and split proteid products, grouped under "anaphylaxis." When, however, the remedy is indicated, the possibility of reaction should not prohibit its use.

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LESSONS DERIVED FROM THE TRAINING OF MEDICAL OFFICERS

By Captain BERTRAM F. DUCKWALL
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SHORTLY after the middle of October, 1917, a letter from the Surgeon General's Office was received by division surgeons. This letter outlined a course of intensive training for the medical officers, the enlisted men of the medical department and candidates for promotion to noncommissioned grades, in all the cantonments. I desire to discuss in a general way the methods used in the 79th Division in carrying out these instructions, and to draw some conclusions based on the practical working of the course.

The subjects to be taught were many and are known to all. It was found advantageous to consolidate certain subjects listed in the instructions under a common heading thus:

1. *Drill:* Infantry drill, sanitary drill, first aid, setting-up exercises.

2. *Manual for the Medical Department:* Geneva and Hague Conventions; cantonment, evacuation, base and general hospitals, including their organization, administration, records and management; contagious disease hospitals.

3. *Army Regulations:* Handling of rations, food, etc., and mess management; Manual for Courts-Martial; Articles of War.

4. *Field Service Regulations:* Rules of land warfare; sanitary service of line of communications.

5. *Military Surgery:* Liquid fire; trench foot.

This grouping of subjects eliminated extra instructors and was of advantage, as well, in permitting the instructors to allot their own time to the proper teaching of these subjects.

The schedule was originally arranged so that all the medical officers of the division would be taught simultaneously, that is to say, while an officers' drill was being conducted in the sanitary train, the same thing was taking place in the regimental classes. The medical officers of the division were divided at the beginning into four classes as follows:

Class I.—Medical officers of the 304th Sanitary Train.

Class II.—Medical officers of the 313th and 314th Infantry, 154th Depot Brigade, 311th, 312th, 310th Machine Gun Battalions.

Class III.—Medical officers of the 315th, 316th Infantry and 304th Engineers.

Class IV.—Medical officers of the 310th, 311th and 312th Field Artillery and 303d Engineers.

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These classes were made up of organizations which were located so near together that they could easily gather for instruction at a given place.

Instructors in the various subjects were chosen from among the officers in each class, and were men who had had some knowledge of the subjects they were selected to teach, either from a medical officers' training camp or elsewhere. Of course, some of these instructors had to be relieved later because their reputed knowledge did not measure up to expectations, or because of lack of enthusiasm in the work, but, in the main, the instructors did very well, particularly in the sanitary train. A chief instructor was named in each class. It was his duty to appoint a place for drill and a place for the holding of lectures. He was also expected to keep careful check on the attendance of officers, and to exert a kind but firm supervision over the instructors in his particular class. The senior instructor in each class was required to submit a special report each week-end to the division surgeon showing in detail the subjects covered during the week and the number of hours devoted to each.

This system of dividing the officers into classes did not work out practically, in this division, for two main reasons: (1) The regimental sanitary personnel were promptly swamped by large numbers of physical examinations of drafted men. (2) Routine work assumed such great proportions, on account of the physical examinations and because of inexperienced assistants, that much of the schedule had to be abandoned for the time.

Most of the medical officers were doing their own clerical work and, at the same time, trying to break in green men as noncommissioned officers or clerks. While, as a general rule, they were men of ability in the handling of their organizations, they were not so well versed in the finer points of administration as to permit them to leave their routine work for a long enough period to attend the training course. The regimental personnel made conscientious efforts to carry out the schedule as laid down, but it was soon evident that some modification was necessary. Accordingly, the organization of classes was broken up, with the exception of the sanitary train, which continued as a single class to the end of the course. Each regimental detachment was constituted a class of its own, and each surgeon was designated to carry out the instruction. Instead of a hard and fast schedule, memoranda were sent out weekly, giving the subjects to be covered during that week and approximately the number of hours it was desired each unit should spend on each subject. Evening lectures for all the medical officers of the division were arranged to be held in the mess hall of one of the ambulance companies.

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The sanitary train was able to carry out the schedule *in toto*, for the reason that the officers had no physical examinations to make, nor had they supervision of infirmaries and sanitation to the extent which prevailed in the regimental units. Furthermore, the sanitary train not being under the line, naturally had more leeway in the conduct of their organization.

A general check on the work of the different units was kept by a special officer designated in division orders as "Training Officer, Sanitary Personnel." This check was constantly exerted through frequent and unlooked-for inspections, roll-calls, and by written admonishments in the name of the division surgeon in flagrant cases of dereliction.

The lectures in the evening, at which all medical officers of the division were expected to be present, except one officer in each regiment to take care of emergencies, were especially interesting and were of an immense amount of benefit. Special mention should be made of the lectures on "Customs of the Service" and the "Medical Department in Campaign" by Lieut. Col. P. W. Huntington, Medical Corps; "Relationship of Officers and Enlisted Men" by Maj. Condon C. McCornack, Medical Corps; the "Tactical Use of Infantry" by Col. Otho B. Rosenbaum, 315th Infantry; "Sanitation in Cantonments with Special Reference to Camp Meade and with Demonstrations of Models" by Maj. Guy L. Qualls, Medical Corps. Lectures on genitourinary diseases, military surgery and psychiatry were given by medical officers of reputation in those subjects. There was no trouble in securing qualified lecturers. It was exceptional for an officer to plead the pressure of duty in order to be relieved from the responsibility of lecturing. Everyone seemed glad to do some part, and no attempts were made to shift the burden to other shoulders.

In a course of this kind it is absolutely necessary that there be considerable didactic teaching. As much of the course as could be was coördinated with routine necessary work, and practical demonstrations were required so far as possible. An opportunity was, therefore, afforded for forming an opinion of the effectiveness of deductive and inductive methods of teaching. It was practically a unanimous conviction among the instructors that quizzes were of more benefit in instruction than lectures. While it was much easier for a man, well qualified in his subject, to lecture than to take the infinite patience to draw out the best points in a quiz, the men absorbed a great deal more information from the latter and remembered it better. This was particularly true where the material could be found in published books or pamphlets, and where the instructors had little to add. The taking of notes

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during lectures, unless the notes be in shorthand, necessarily allows intervals or gaps in the theme which cannot be filled very easily. Subsequent quizzes reveal that many important matters are omitted from the notes. Consequently it is more than ever impressed on the writer that precious time is lost in lecturing and quizzing on the same subject. By quizzing, a good instructor can not only bring out points from his own experience, but can materially shorten the time to be devoted to a subject, as well as gain better attention.

Drill was given more weight during the course than any other subject, first, because drill is the best method of acquiring prompt obedience to orders (and everyone knows that medical men from civil life have usually been accustomed to doing things in their own time); second, drill properly taught gives the individual a military appearance, a set-up, which can only be acquired in that way; third, drill is the best teacher of coördination.

Infantry drill was used during the first couple of weeks because infantry drill is the real basis of our sanitary drill, and because a medical officer should be more or less informed about the parent of all drill regulations. Subsequently sanitary drill was instituted and maintained during the course. At first the officers were drilled in company together by an experienced officer. Later, as they became more proficient, each officer was given his chance to drill the rest. The importance of properly giving commands and of correcting mistakes was impressed on the officers as thoroughly as could be done.

Besides the practical drill, several quizzes were held in which medical officers were required to explain the movements laid down in the regulations as well as in the new litter drill as given in circular from the War Department. These quizzes were of immense advantage in fixing the knowledge gained on the drill field. Later, when the officers were sent to their respective organizations, they were in every way better qualified as leaders of men than they could have been in any other way.

Towards the end of the course a board of medical officers was appointed to conduct examinations in the course. These officers were instructed to take into account not only a man's proficiency in the course of training but his adaptability to the service, his initiative, his zeal, and his qualifications for purely professional work or work in the field with troops. The board framed a series of confidential questions to be answered by different superior officers concerning their juniors, and these reports were a vast assistance to the board in forming its opinion of the officers and in its findings.

A few deductions from the experience gained in carrying through this course of training may not be out of order:

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First, a good organization is absolutely necessary. There must be a head and subdivisions, each with its own responsibility.

Second, a constant check must be exerted to prevent slackness, indifference, or lack of interest.

Third, classes containing more than one regimental medical personnel are only feasible when there are sufficient trained sergeants, and when the chaotic state preceding organization is obviated. Otherwise such a course must be left to individual surgeons.

Fourth, the Sanitary Train is perfectly able to carry out a schedule in detail as a unit.

Fifth, deductive teaching is the better method for rapidly impressing essential matters. Inductive methods seem to waste much valuable time.

Sixth, drill is properly taught practically both in and out of ranks, and this practical instruction should be supplemented by quizzes to fix the knowledge gained.

Seventh, an examination by a board of medical officers is indispensable, because it serves to stimulate the acquisition of knowledge and attention to duty. It is likewise a good filter by means of which medical officers of known inefficiency can be found wanting, officially.

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EDITORIAL

PUNISHMENT OF ARMY MEDICAL OFFICERS

The dismissal from the service, by sentence of court-martial, of two medical officers of the National Army and the return of the proceedings to the court by higher authority, calling attention to the inadequacy of the punishment, may well give us pause.

We are not permitted to, nor would we, question the findings; no doubt these presumably young, and certainly inexperienced, medical officers were guilty of conduct prejudicial to extreme humanitarian practices, though, we are told, one was strictly obeying an order and the other a regulation. They were not soft and sympathetic, but were they guilty of conduct to the prejudice of military discipline, or unbecoming an officer and gentleman?

It cannot be accepted that the medical officer has no responsibility for the discipline of the army; every officer has that. To be sure, he has nothing to do with "knock-down and drag-out" methods, but he has a moral function which, if properly exercised, should be a real factor in military discipline. To meet this obligation demands a tact and experience which we do not expect to find among the very recently appointed medical officers and, for these reasons, either they should not be placed in positions of responsibility or, if necessity requires that they must, their limitations should be given due weight.

We learn from the public press that in one of these cases it is alleged a soldier suffering from pneumonia in advanced stage reported at surgeon's call for treatment and, because of failure to properly salute the attending medical officer, was reprimanded, given "double duty" (which he did not perform), and died two days later.

In the old Army, at least, it was not customary for the soldier to salute when reporting to the surgeon at surgeon's call. He removed his hat and awaited interrogation; he was treated with consideration and the medical officer with respect. Of course, all who know anything of military matters understand that the procedure at this function is eliminative—the separating of those who are, in the opinion of the attending surgeon, incapable of performing their military duties from those who are capable. The men whom he deems incapable he recommends to be excused in quarters or hospital, and those who are, in his opinion, capable he recommends to be returned to duty. He is absolutely without power of execution; his sole

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function is that of recommendation. To be sure, the commanding officer usually accepts the recommendation of the surgeon, but he is not obliged to; nor did he in this case—at least, the company commander did not.

Ordinarily, the surgeon does not place a man's name on the sick list; that is done by his company officer and, according to the phraseology of army regulations, "the enlisted men of each company who require medical attention will be conducted to the hospital or infirmary by a noncommissioned officer, who will give to the attending medical officer the company sick report book containing the names of the sick. The medical officer, after examination, will indicate in the book opposite their names the men who are to be admitted to hospital and those to be returned to quarters, noting what duties the latter can perform and any other information in regard to the sick which he may have to communicate to the company commander." From this it will be seen that "surgeon's call" is a formal function and should be conducted in a military way.

It would appear from the published reports that this regulation was carried out and the attending surgeon must have examined the man, for he noted that, in his opinion, the soldier was capable of performing full duty, indeed "double duty," though just what this means is not apparent. He probably was mistaken, as the man died two days later of pneumonia.

We have not read the evidence, but he might not have been mistaken in his diagnosis. The case of a well-beloved general officer, who recently died of pneumonia, comes to mind. One Sunday he arose feeling unusually well and spent the day automobiling. That night he was taken with a chill and died the next day of pneumonia.

Now, let us consider the situation generally. Our camps contain a certain number of unwilling soldiers who seek any possible means of getting out of the service short of desertion, and some do not stop at that. The admirable article on "Malingering" appearing in this number of THE MILITARY SURGEON, by permission of the Surgeon General of the Army, gives very convincing evidence that the "slacker" is amongst us and that his assault is chiefly upon the Medical Department. This being the case, is it surprising that our inexperienced medical officers should lose patience and poise in their sometimes ill-judged efforts against malingering? In this case, unfortunately, the wrong man was picked. But, says the humanitarian, is it not better that ninety-nine malingerers should

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escape than that one sick man should be punished? Possibly, but what would be the result of such on the efficiency of the Army? Soldiers are not humanitarians and war is not soft. To win it is the sole object of our existence as soldiers and the only measure of our efficiency.

A medical officer has been dismissed from the service because of a mistake in diagnosis, which led him to mark a man for duty in what he probably thought was the interest of the service. There may have been attending regrettable circumstances and he may have been unfit, generally, for his important office. We don't know, but these are the underlying facts. Is it to be presumed, in the light of these facts, that any wise medical officer who desires to retain his office and avoid the possibility of imprisonment—for this is apparently what the authorities wish to inflict upon this officer—would ever again send any man to duty who reports at surgeon's call and insists that he is sick, if the authorities should persist in such an attitude? From the time medical officers are convinced that this is the unalterable determination of the War Department, the sick report will go up with leaps and bounds, the medical officers will cease to perform their highest function, "the maintenance of strength of armies in the field through the prevention of disease," and the Army will become a mass of malingering "invalids," demanding all their time and attention.

The persistent and unwarranted attacks upon our medical officers in 1898 resulted in just this condition. The sick rate went up stupendously and continued for years after that war, during which period Sir Alfred Keogh remarked, "The American Army has the worst sick rate of any army in the world." This was the direct result of dread on the part of our medical officers that they might be treated as this physician has been.

If medical officers are guilty of a military crime, they should be punished like other military officers, but if they are to be declared felons because of a mistake in diagnosis, who of us can escape? We are trained in the school of humility and self-sacrifice; we have renounced much of our material interests to loyalty to our country and the desire to be of assistance in this great emergency; we are even willing to be a camouflage for the shortcomings of others, but we insist upon reasonable freedom of opinion in the practice of our profession, with a fair margin for error, and equal justice with other officers in the exercise of our military duty. If we steal, we should go to the penitentiary, but not if we are mistaken in the

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diagnosis of a case. If we cannot have this freedom and justice; if we cannot be exempted from the daily interference of line inspectors wholly unfamiliar with the conduct of hospitals of any kind, but who, apparently, are authorized to give orders concerning such, notwithstanding that the Medical Department has trained inspectors for this very purpose, we must fail in our work.

THE MEDICAL CORPS OF THE ARMY

Almost a year has elapsed since war was declared, and it is well on toward two years since mobilization on the border was ordered, so quite time enough has been afforded to determine whether or not the Army is developing a real medical team.

We certainly started off better than ever, for from the beginning we had, what our country never before had, a fairly clear-cut idea of what there would be to do and how to do it. We had determined upon the form of our matériel and had collected as much of it as Congress would permit; we had set forth in our regulations, so clearly, the official duties of the Medical Department and how to accomplish them, that even "those who run might read" and understand them; and, better than all, we had had not only most of our Regular medical officers on the border for months, but many of those of the Reserve and National Guard as well, trying out our plans; so we started into the war with a greater number of fairly well-trained medical officers than at any time in our history. Nor was this all, for the department had endeavored, in every practical way, to disseminate among the profession at large a working knowledge of the Medical Department.

All of this effort, beginning with the Spanish War, has enabled us to make an unprecedented start and already to reach, with us, unprecedented results. Probably no people ever mobilized from a condition of profound peace, from a state of mind to which war was utterly abhorrent and who were so wholly unprepared for military activity, with such relative smoothness as did ours. In this the Medical Department had, did, and is doing, its full share. Nothing but praise is due us, in the aggregate.

Now comes the question: Is there room for improvement? If so, where and how? Owing to antecedent conditions, a compromise between the best and the possible, we started into the war with an organization which was not homogeneous; we had, and continue to have, officers coming from at least three distinct classifications, each one of which is irresistibly actuated by impulses quite different from the others. The law itself makes certain distinctions in status, and regulations attempt

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to make others, which the Judge-Advocate General is frequently called upon to interpret, so involved are things. Such a condition must of necessity interfere with the solidarity of the corps and seriously hinder the all-round team-play so necessary to continuing good results.

Now that we are getting to have a reasonably fair understanding of our duties, would it not be better that we should all belong to the Medical Corps, U. S. Army, without any hyphen? Regular, Reserve, Militia have today no real significance, so far as duty status is concerned, and why should they remain to differentiate us, when differentiation is unnecessary, indeed actually harmful?

In the permanent establishment the law recognizes two classes of active officers, "permanent" and "temporary," the status of each of which is known to all, both having equal standing as to rank and promotion. What better precedent than this do we of the Medical Department need? Put us all into the Medical Corps U. S. Army, the M. C. P. and M. C. T. being exactly upon the same status in every respect, except as to tenure of office. Then, when the war is over and the necessity for an enlarged permanent corps arises, which has always been the case, those who elect to remain and whose record and proved attainment justify, can change the T to the P, without any other change.

The following amendment to the National Defense Act (S. 1786), introduced by Senator Owen, is now under consideration and undoubtedly will pass in some form—

Provided, That hereafter the commissioned officers of the Medical Corps of the Regular Army shall be distributed in the several grades as follows:

		Per cent
Major generals		0.25
Brigadier generals		0.25
Colonels		4.00
Lieutenant colonels		8.00
Majors	23.5	
Captains	32.0	
Lieutenants	32.0	
		87.50
		100.00

Provided, That when called into service the numbers of the officers of the Medical Reserve Corps shall be seven to the thousand of men in the National Guard and National Army and the relative grades of the officers of the Medical Reserve Corps shall be the same as the grades of the Regular Army.

The President shall have authority to appoint officers of either corps as "consultants," with the duty of acting in an advisory capacity, making inspec-

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tions and reports on medical, surgical, or sanitary questions, and such other duties as may be required by the chief of the Medical Department.

Should the second proviso be changed by a few words we would have a homogeneous organization, every member of which would stand four square with every other, the name of every officer would have a fixed place on the single roster of the Medical Corps, relative to every other officer, and M. R. C. and N. G. would be relegated to obsolescence in the active army. A seemingly little thing, but an immense promoter of efficiency both in administration and execution.

To accomplish this, the second paragraph should be changed somewhat as follows:

Provided, That when the officers of the Medical Reserve Corps and of the Medical Corps of the National Guard are called into service, they shall become temporary officers of the Medical Corps, U. S. Army, and shall be in number equal to seven to the thousand of men in the National Guard and National Army, and the relative grades and rank of the temporary medical officers shall be the same as that of the permanent officers of the Medical Corps, U. S. Army.

With such a law and our organization completed, we would have a corps the *esprit* and efficiency of which would be unsurpassable.

THE HIGH HEART

More and the more the deeper significance of the struggle in which our Allies have been engaged for over three years, and in which we are now to join them, comes home to us who associate daily with the brave men who come back for a few days from hell, to return again with strong and steadfast confidence in the ultimate outcome. How can they endure it? How can they keep on without a thought of yielding?

There is only one possible solution to this psychological problem. It is not solely a question of military discipline, of mere physical endurance. "It is the Spirit that quickeneth," as Sir Douglas Haig has always held, and who is more competent to judge? "Moral" we call it in formal definition, but it is deeper than that, for only great souls can inspire such deeds.

Much has been written about the superb courage and *élan* of the French and British soldier, but words are imperfect media through which to picture them. Only one thought is uppermost as one, who has never been under fire, hears from their own lips how these brave men calmly and without fear go forward cheerfully to certain fate, led by their officers whom they trust in life and death. Yet these men are peaceful and home-loving, like our own citizen-soldiers, and do not kill for mere lust of slaughter. Those who escape, shattered and broken for life in their glorious young manhood, have no regrets that they are

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flung out of the battle, driftwood on the fiery waves. It was their duty and they ask no more. Wounds, agony, death—all are mere episodes, and the individual is content to be only an atom in the large design. This is what keeps them to their hard and apparently hopeless task, and this will keep them to the end.

One is silent before this. "It is high, I cannot attain to it."

We have reason to be proud of our medical reserve corps. I have talked recently with a little group of young lieutenants ill in hospital, suddenly transported from a peaceful, humdrum country practice to all the horrors of Flanders. They are all alike—they have caught the inspiration of their British comrades and have been cast in the same heroic mould. They will all return there, for they cannot do otherwise. No thought of promotion, no care for medals and decorations—only duty. Ye gods! When I think of the mushroom captains and majors at home, of the carpet-knights who are counting the cost, I wish that they could hear the experience of these boys.

Physical training and military discipline, sanitation, paper-work—they are all right in their place, but they will be merged, in the trench and dugout, in No Man's Land, in the cold and wet and hunger, into the spirit, which alone remains.

Shall we not teach that, shall we not analyze and eliminate the causes of fear, shall we not cultivate in our young medical officers strong hearts and calm minds in every emergency, failing which all theory and practice are vain?

One's viewpoint changes over here. We wonder if we shall stand the test of battle as well as the medical officers of our allies have done and be ready, like them, for the supreme sacrifice. We *must*. There can be no swerving from the path that lies before us, stretching far into the unknown future and ending God knows where. The high traditions of our corps must never be forgotten. Only the high heart can keep us strong and true to the end.

H. C. Coe.

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ASSOCIATION NOTES

A meeting of the Executive Council, at the call of the president, was held in Washington, February 12, 1918, to provide for the temporary filling of the office of treasurer, Assistant Surgeon General William C. Rucker, U. S. P. H. S., having been ordered to duty in foreign parts.

Col. John Van R. Hoff, M. C., U. S. A., Retired, a former president of the Association, consenting to act temporarily, was duly elected treasurer *ad interim*. He requests that all correspondence with the treasurer's office be addressed to *The Association of Military Surgeons U. S., Army Medical Museum, Washington, D. C.*

The following named 189 gentlemen, having qualified, were duly elected members of the Association:

Medical Corps, U. S. Army

Major

Frank K. Boland
Henry K. Gaskill
James F. Johnston
James S. McLester
Eugene E. Murphy

Captain

Geo. W. Jean, Ret.

First Lieutenants

Wm. Milton Caffee
Gilbert O. Crank
Wm. D. Middleton

U. S. Navy

P. A. Surgeon

Clarence C. Kress

Assistant Surgeon (R.F.)

Ralph A. Gowdy,
Harrison L. Wyatt

Associate Member

Benj. H. Frayser, formerly 1st Lt. M. R. C., U. S. Army

Medical Corps, National Guard (U. S.)

Majors

Floyd J. Bolend
Victor E. Bonelli
James H. Gambrell
Robert A. HassKarl
Thos. J. McCamant
John J. O'Reilly
Claude L. Pridgen
Thomas H. Scott
Ross H. Skillern
Homer T. Wilson

Captain

Carlos G. Webster

First Lieutenants

Charles P. Austin
Carleton B. Austin
Fager M. Babcock
Jacob O. Carpenter
James H. Damron
William P. Fite
Stephen H. Graham
Julius A. Johnson
Robert S. McGeachy
Ben M. Meriwether
Solon Miltner
Paul C. Murphey

1st Lieutenants—Con't.

John Z. Niras
Claude V. Orr
David B. Sloan
Fred W. Standefer
Andrew M. Young

Medical Reserve Corps, U. S. Army

Major

E. L. Parmenter

Captains

William H. Baldwin
Benj. Clyde Barnard
Edgar W. Bedford
Ernest H. Bitner
John Bryant
Michael A. Burns
G. Edward Campbell
William G. Cassells
Geo. P. Cogswell
Clarendon J. Combs
Omar L. Cox
Charles P. Edwards
Eugene C. Foote
John M. Firmin
Chas. B. Fitzpatrick
Roy H. Garm
Ejnar Hansen
Joseph C. Hynes
Charles S. Jordan

Captains—Con't.

Judd H. Kirkham
Otto W. Koch
C. S. Lawrence
Mason B. Light
Vifgil Loeb
Cabot Lull
William G. Maness
Smith E. McAdoo
Thomas R. McHugh
Leon S. Medalia
Harry T. Morton
Wm. S. Newcomet
Samuel D. Nixon
Gilbert R. Owen
Henry Pleasants, Jr.
Daniel P. Ray
Henry O. Reik
Herman H. Runo
Millard F. Sewall
Edward Swann
Austin L. Ward

First Lieutenants

Earl V. Adams
John L. Aleshire
Andrew J. Andersen
John H. Arnett
George A. Baker
Edw. F. W. Bartol
Harry F. Beebe

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1st Lieutenants–Con't.	*1st Lieutenants–Con't.*	*1st Lieutenants–Con't.*	*1st Lieutenants–Con't.*
Edward P. Berg	Louis E. Eslick	James M. Kerns	Donald W. Porter
Alex. S. Blanchard	William J. Ezickson	Lucius Lamar	John G. Pratt
Joseph A. Boarts	William J. Ferguson	Herb. S. Langsdorf	Carl H. Robinsteen
Julius R. Bolles	Eugene E. Fleming	Joseph S. Lawrence	Floyd P. Romberger
Ralph H. Bookmyer	R. R. T. Furlong	Milford Levy	John T. Rose
Leonard J. Bowman	Robert L. Gallaher	Robert L. Levy	Alvin P. Scheib
Lewis L. Brodsky	Lucius G. Gage	Moses Lobsens	Sidney Scheinman
Wm. E. Broughton	William H. Gehl	John P. Long	Nathan S. Schiff
Albert J. Bruecken	Charles W. Gentry	Michael R. Long	Henry H. Sherk
John F. Byrne	Francis M. Ginley	Dennis J. Lowney	Percy B. Skinner
Robert E. Calhoun	James M. Graham	Thomas W. Martin	Elisha B. Smith
William J. Circe	Benj. E. Graham	Selim W. McArthur	Austin E. StClair
Edward P. Clark	William S. Gramling	William C. McCord	Henry W. Straus
William P. Clough	Thomas W. Grayson	Harold J. McDonald	David Sussler
Chas. W. Colebaugh	P. Guitierres	Clar. R. McDonald	Dolph M. Teixler
J. de Raismes Combes	Claude F. Hayes	Joseph O. McKeon	Langdon T. Thaxter
Hugh I. Conn	Eugene H. Hayward	Monroe A. Meyer	George H. Trevelyan
Grover C. Conyers	Ara B. Hewes	Walter L. Misener	Thaddeus S. Troy
James P. Crawford	Simeon Hopper	D. DeW. Moncrief	Cyrus W. Truxal
Royal C. Danley	William R. Johnson	Levi Murray	Louis J. Ullian
Willis L. Dixon	Charles L. Jones	Arthur S. Needles	Fred S. Watson
William Dwyer	Ester L. Jones	Harold R. Neeland	Frederic B. West
Burt A. Dyar	Lawrence J. Kaasa	Carl A. Neves	Cloyd F. Wharton
Franklin C. Eleded	Clifford L. Kaucher	James L. Orr	Roderick B. Wittich
Edgar B. Elvis	Claude D. Kellam	Hamilton C. Perkins	Sid. J. Wolfermann

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The Royal Society of Medicine Club, London

The Royal Society of Medicine, London, has extended to all our medical officers the privileges of its famous Club House, during their sojourn in London. In a recent letter the general secretary wrote: "I hope you will do all you can to make as widely known as possible our invitation to our American friends, for, although I have done everything I can, I still meet many of your officers who know nothing of it. I wish it were possible for your Army Medical Service Department to take official cognisance of it and inform all its officers before they set out for this side. If this could be done I would gladly send over a supply of circulars for this purpose."

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COMMENT AND CRITICISM

METHOD OF PROCEDURE IN THE EXAMINATION OF SELECTED DRAFT AT CAMP UPTON, L. I.

THE MILITARY SURGEON is glad of the opportunity to publish Lieut. Col. Charles R. Reynolds' report of the physical examination of the men of the command of which he is the division surgeon. This report sets forth clearly and briefly a very practical, efficient and quick way of performing what is a most important, not to say stupendous task. It also presents certain recommendations, which evidence the fact that the last word has not yet been said regarding these examinations of great masses, and suggests the thought that THE MILITARY SURGEON would be pleased to hear from other medical officers who have directed or participated in such examinations, upon this subject—EDITOR.

1. *Arrival of Troops.*—Troops arrive at camp the day before the examination is to take place and are housed in casual barracks; sometimes being definitely assigned to organizations at this time or immediately after physical examination. After passing through officers detailed from the mustering office and receiving their qualification, designation and assignment, and physical examination blanks, Form 1010 P. M. G. O., they are ready for the physical examination.

2. *Preparation for the Examination.*—The same evening complete alphabetical lists of all men arriving at camp, according to the barracks in which they are located. are forwarded to the officer in charge of physical examinations. Accompanying these lists are forms 1010 P. M. G. O.

These lists are all checked to see that the examination blanks tally with the names on the list. The lists show the local board number, serial number and call number of each man, and are valuable as means of identification. All men whose records are not complete are held in the casual barracks and are not examined until all records pertaining to them have been received. The mustering office is charged with the correspondence necessary to obtain the record.

3. *Method of Examination.*—The arrival of the men at the examination room is regulated by directions from the medical officer in charge, who calls for detachments of 200 men, under their barrack or company commanders, who await examination of their men.

Two hundred men an hour is about the rate at which they are called, thus making it possible to examine, with the scheme hereafter outlined, about 1,600 or 1,700 men per day.

One of the infantry barracks is obtained for doing this work. It is divided into four large rooms and arranged so that each complete examining team occupies one room, as per diagram page 341: Each examining team is composed of eleven medical officers, one dental officer, and forty enlisted men. Each man has his own particular work to perform. The examination room is so arranged that a steady, straight line of recruits passes from one examiner to the

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other without turning back until each examination is completed. This avoids confusion and prevents men getting away without complete examination. The arrangement of the examiners is as follows:

At the table for giving out the recruit cards, Form 80, and the identification blanks, are seated five enlisted men who record the name, address, local board number, serial number, and fill in certain data on the identification blanks. From there they pass to the dental surgeon, who has one enlisted man as assistant and recorder. From there they go to the

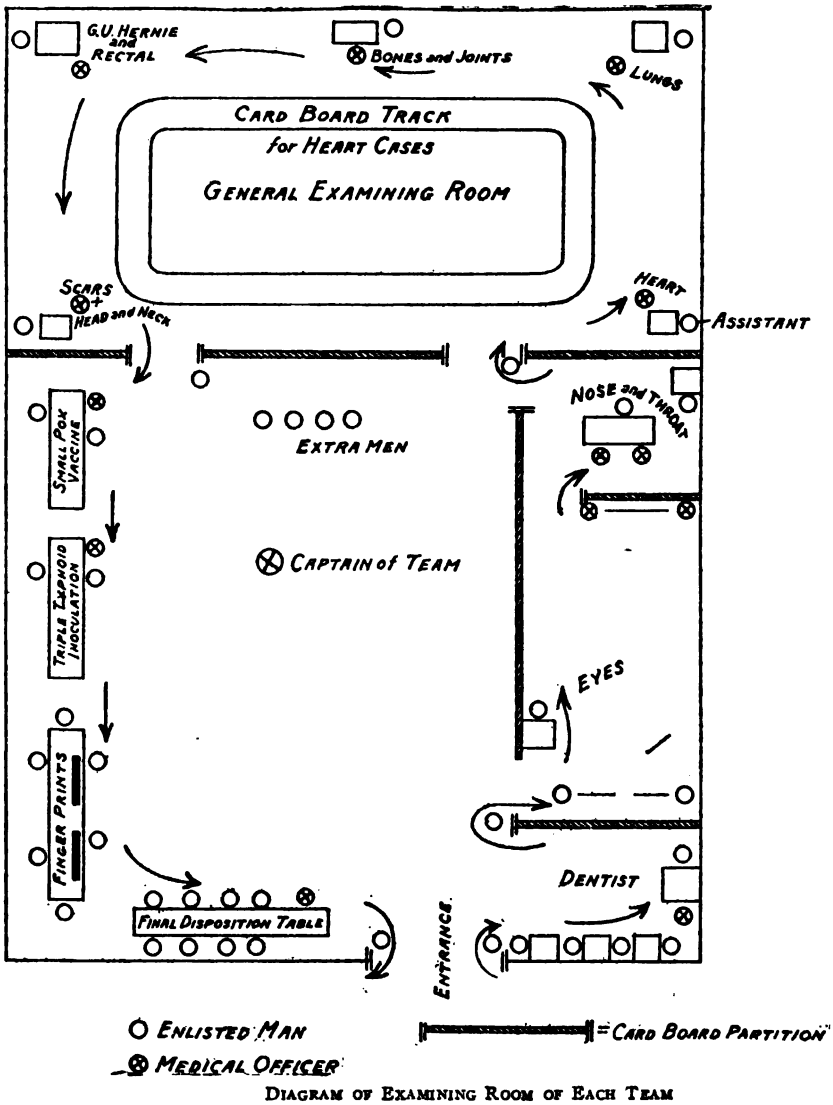

Diagram of Examining Room of Each Team

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eye room, which is in charge of one medical officer and four enlisted men; then to the ear, nose and throat room, which is in charge of one medical officer and two enlisted men. From there they go to the general examination room, where the examination is conducted in order—bones and joints, in charge of one medical officer and one assistant; from there to a medical officer and one assistant who examine the heart; then to a medical officer with one assistant who examine the lungs; then the height, weight and chest measurements, four enlisted men and one acting as recorder, and from there to genito-urinary, hernia and hemorrhoids, in charge of one medical officer and one assistant. From there they go to a medical officer, who has one assistant, who makes a superficial examination of the body and completes the outline figure card. From the general examining room they pass to another screened-off section, where one medical officer and two assistants give the smallpox vaccination, immediately followed by the triple typhoid inoculation, under the direction of another medical officer and two assistants. At this place the Schick test can be administered unless it is advisable, as has been found to be the case at this camp, to start the Schick test at the time of the second typhoid inoculation. Too many inoculations and vaccinations sometimes will cause a large proportion of the men to faint. From here the men go to the finger-print table, which three enlisted men operate under the supervision of a medical officer. At this point, unless the men are especially skilled, there is liable to be delay necessitating doubling the number of men at this table, which we found to be necessary in most instances at this camp; that is, six finger-print operators for each team, or eighteen altogether in the building. The number is entirely dependent upon the necessary speed to be maintained.

The men now pass the final table, at which are seated eight enlisted men and one medical officer. Their duties are to transcribe the physical findings from the recruit card to the physical examination blank, Form 1010 P.M.G.O., to see that all data are correct and that the man goes through with the papers in his possession. The medical officer signs both the physical examination and identification forms. If the medical officer at this table directs a special examination, as shown by the recruit card, the man is sent to the special examining room, to the particular specialist which his condition requires. It is necessary at this point to have an orderly conduct the man to the special board. From the special examining room the recruit is conducted into the office of the "officer in charge," who rules upon the data sent in by the specialist and recommends, according to the requirements of the War Department, whether or not the man is accepted for the military service, and signs the examination blank accordingly.

One team of examining specialists has heretofore been sufficient to handle the number of examinations turned out by three examining teams—about 20 per cent of the total number examined.

No man is recommended for rejection or discharge until he has been through the special examining board.

Acceptance.—All men accepted are sent in command of their organization commanders to the Mustering office immediately after examination. Each man carries with him Form 1010, P. M. G. O., identification record and designation card.

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Rejection.—Complete tabulated lists are prepared in the case of all rejected men, giving the name, local board number, home address and cause for rejection. Two of these are sent to the mustering officer with the men, usually in groups of about twenty, with all their papers for immediate discharge. They are discharged by the mustering officer on Form 638, P. M. G. O., by authority delegated by the division commander. One copy of this list of men recommended for rejection is immediately sent to division headquarters for the preparation of an order directing the discharge. This is necessary, as the men may have been assigned to organizations, and from the list the company commander can obtain all the data necessary for his muster roll, pay roll and other reports.

Two copies of the list of rejections are retained at the examination barracks. This is important for future reference, as experience has shown the necessity of referring to a large percentage of these cards at later dates. The cards, Form 80, of accepted cases are filed alphabetically and also according to date of examination. The cards of those recommended for rejection are filed in a similar manner but separate from those accepted. Each month a complete alphabetical tabulated list of all rejections is made and kept on file in the office of the division surgeon for reference, which has proven a necessity.

In this scheme it will be seen that there are six examining teams in addition to one team of specialists; three teams work four hours in the morning and three work four hours in the afternoon, arranged by roster. The captain of each team is held responsible for the presence of officers and enlisted men and for errors incurred in the examination of recruits and the papers connected therewith.

Special Board Composition.—One dental surgeon, three eye specialists, two ear, nose and throat specialists, two specialists in tuberculosis or lung diseases, two cardio-vascular specialists, one surgeon, one orthopedist, and two psychiatrists or neurologists.

Recommendations.—Assuming that a new body of men is to arrive in daily increments, to replace a departed division at a cantonment complete in point of construction, and with at least a large part of the divisional medical personnel for the new division, it is recommended: (1) That the routine physical examinations be conducted by the divisional medical personnel, arranged in concentrated teams or boards, as outlined in the description of the method of examinations of the Seventy-seventh Division at Camp Upton—September to December, 1917. (2) That special boards, composed of one dental officer, three eye specialists, two ear, nose and throat specialists, two specialists in tuberculosis and lung diseases, two cardio-vascular examiners, one surgeon, one orthopedist and two psychiatrists or neurologists, be provided for each camp, to pass on all abnormal cases before they are recommended for rejection. These boards might be assembled from the personnel on duty at the base hospital, or organized and go from camp to camp, as required.

In favor of this scheme of examination as against the method of examination by the regimental surgeons of their own men after assignment, the following advantages are suggested: (*a*) A high degree of effectiveness and team work is obtained, and large numbers of men can be examined in a short time. It is

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COMPLETE STATISTICAL REPORT OF EXAMINATION OF RECRUITS AT CAMP UPTON, LONG ISLAND, NEW YORK, TO DECEMBER 20, 1917.

	1, 2, 3 and 4 increments	5th increment (colored)	6th increment	Men arriving during interim[1]	Total to above date
No. of men examined	29,947	1,200	8,365	2,188	41,700
No. of men rejected	2,239	79	633	879[2]	3,830
No. of special examinations	4,200	200	1,963	2,560[3]	8,924
No. of hours per day worked	8	8	8	Avg. 8	Avg. 8
No. of doctors on each examining team	11	11	11	" 11	" 11
No. of teams working at one time	3	3	3	" 1	" 3
No. of doctors on special team	12	12	12	" 12	" 12
No. of hours worked by each team daily	4	4	4	" 2	" 4
No. of teams working daily	6	6	6	" 1	" 6
No. of enlisted men on each team	40	40	40	" 30	" 40
No. of hours worked by special team daily,	8	8	8	" 2	" 8
Total No. of doctors employed	78	78	78	" 24	" 78
Total No. of enlisted men employed	280	280	280	" 60	" 280
No. of days required to complete examination,	14	1	5	.....	" 55
Total No. of hours worked by teams	112	6	39	" 120	" 277
No. of men examined per hour	267	200	214	" 140	" 205
Percentage of rejections	7.47	6.5	7.5	.....	9.2
Time necessary for one man to be examined, minutes	30	40	34	.....	30

[1] In the column headed "Men arriving during interim" it was very difficult to keep an exact tally on the work performed by each team, as this work was done more leisurely and the casuals came in a very irregular manner.

[2] Includes rejections upon reëxamination.

[3] Includes special examinations made on men who were reëxamined.

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the only method that will be satisfactory in a rush. At this camp we examined over 2,800 men in a day in some instances. (*b*) All doubtful cases can be referred immediately to the specialists and prompt rejections made. (*c*) All records are concentrated in a central recruiting office, which experience shows, continues to function thereafter in furnishing information and data for future examinations and reëxaminations and for the many inquiries, requests and complaints that are received. (*d*) It offers opportunity for supervision impractical with regimental teams. Only one experienced supervising examiner is required to pass on all cases recommended for rejection or presented for decision. (*e*) It offers good opportunity for conference and consultation and instruction of all routine examiners by the specialists. (*f*) It is a necessity and works well in case men are not assigned to regiments immediately upon arrival. There will always be casuals or unassigned men, and a concentrated casual medical personnel must be provided for these. It is extremely important where a camp is not completely constructed and in which the tactical organizations have not been organized or formed.

3. *Oversight of Local Examining Boards by Experienced Medical Officers.*—The greatest number of mistakes made by the local boards are in the acceptance of cases of defective vision—over 30 per cent of all rejections at this camp. It seems likely that the local boards are suspicious of defective vision cases and send them to camp in order to play safe, or possibly because they are not equipped with the proper facilities for making examinations. It is understood that a supervisory or consultation board has been arranged, but if not, special boards might be appointed to visit the large recruiting centers to pass upon doubtful cases before they are sent to camp.

4. Complete cardio-vascular examinations should be made at the time of original physical examinations.

5. The tuberculosis survey should start immediately so as to complete all examinations within one month after the men report for military service. The earlier rejections are made, the fewer cases of claim on the Government will be presented. War risk insurance and allotments should not be allowed until all of these examinations have been completed.

6. Rejections upon reëxamination are authorized to be made on Form 638, P. M. G. O.; this without the preparation of certificates of disability. Discharges or rejections upon reëxamination should be allowed only in cases referred to and passed upon by the Special Examining Board.

7. Abolition of the sick and wounded cards, Form 52 (of rejected men at first examination at camp). It is believed that Form 1010, P.M.G.O., should be accepted as the substitute for sick and wounded cards as it contains all essential data. Difficulties of magnitude are encountered in the preparation of the sick and wounded card and numerical sheets, in camps, before the complete organization of regiments and regimental infirmaries and with inexperienced medical officers—conditions very likely to exist in the future.

8. Abolition of finger-prints (identification record). This is presented for consideration, but definite conclusions have not been reached at this camp. After weeks of training, identification records are satisfactory; before that most

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were almost useless. Special training of enlisted personnel must be given before the examination of increments begins, otherwise nothing but failure will result in the hurried examination of large bodies of men. The value of finger-prints to the War Department must be decided there; so far, at this camp, the use of them for subsequent identification has been invoked in but one case. In this connection we invite attention to the necessity of recording and filing the identification records of all rejected men as, under the selective draft law, these would seem to be of importance in investigating cases of impersonation.

TO ELIMINATE LICE[1]

Major D. R. Lucas, M. R. C., who several years ago devised and described in THE MILITARY SURGEON a "straddle trench cover," with opportunity and experience has developed this into the "squat latrine cover," the advantages of which he has set forth in an official communication we shall presently quote *in extenso.*

Lieut. Col. John W. C. Abbott, C. A. C., commanding Fort Tilden, where Major Lucas was on duty, forwarded the latter's report with the following indorsement. "The latrine cover is the most satisfactory and sanitary, the simplest and cheapest to construct and the easiest to transport, of all the devices for this purpose that have been brought to the attention of the fort commander."

THE MILITARY SURGEON has heretofore quite emphatically expressed its views as to the many advantages of the squatting over the sitting position, in the act of defecation, and it lives in the hope that the time is not far distant when the so-called box latrines shall be wholly abolished in our service except for the aged and invalid. Even in barracks the "squat cover" placed over a trough of running water would be equally acceptable and far more sanitary than the present public toilet, which everybody approaches with suspicion—while the physiological advantages of the posture cannot be questioned by anyone who is at all familiar with the instinctive habits of mankind. We wonder if such an appliance is shown and discussed in our schools of applied hygiene.—EDITOR.

Major Lucas writes as follows:

Lice are now recognized to be a factor of such magnitude in decreasing the effectiveness of troops engaged in this war, as to call for every possible means looking to their eradication. It has recently been determined that lice are the chief agent in transmitting typhus fever. Their effect in this respect has become so prominent that their action in producing ill-health and loss of effectiveness of troops in other ways, (through itching caused by the insertion of the haustellum, and the dermatitis, of eczematous character, from scratching, not to mention other fevers), may be underestimated. The latter effects should not be neglected or minimized. Typhus fever will, we believe, be as effectively prevented by prophylaxis as has typhoid; but this confidence may

[1] With three illustrations.

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lead us to neglect an important cause of noneffectiveness of troops through irritations of the skin. We mean *Pediculi hominis.*

There are three varieties of lice that infest the human species; namely, the *Pediculis capitus, vestimentorum, and pubis.* The general presence of *pediculus pubis* (crab lice) in camps in the United States, is exemplified, I believe, by a careful physical inspection of a division mobilized for border service, made during the summer of 1916, which revealed infestation as high as 40 per cent of certain regiments of apparently clean troops; where shower baths were well constructed and ample, the weather warm, and the standard latrine box, Quartermaster's Corps, was used and, ordinarily, well policed. The final report of the division surgeon was that the sanitation of the camp had been generally good throughout. The standard latrine box, Quartermaster Corps, having been supplied, it was impracticable then to obtain funds for the provision of a latrine cover which would prevent contagion. [1]

It may be well to state that it requires a sharp eye and careful searching at times to discover the *Pediculus pubis,* as it is almost transparent, and usually attached to the hair, head downwards, and close to the skin; in fact the nits are more easily seen than the insect itself, which latter will often be overlooked in the ordinary physical inspection, unless carefully scrutinized, or nits in numbers attract attention. Col. C. Y. Brownlee, M. C., U. S. A., expressed his opinion to me that the *pediculus pubis* is as guilty of carrying typhus fever infection, as the other two varieties of lice. The crab louse is not liable to cause the degree of itching that the body louse does; however, in this respect, it is to be likened to the venomous snake that does not warn before it strikes.

After nine months of further observation of the relative merits of the ordinary privy seat and the latrine for use in the squatting position, while on duty with troops at the beginning of construction of Fort Tilden, Rockaway Beach, N. Y., it appears that the results warrant an additional report. The apparatus has been improved through the necessities of local application and the principle is recommended, not as a makeshift to be used in conjunction with straddle trenches, but as a complete substitute for all forms of common privy seats in use by troops.

During the month of March, 1917, latrine covers with seats were constructed at this post by the post quartermaster, patterned somewhat after the Havard box latrine cover. They were made of white pine tongue and groove boards, 8 inches wide, which gave numerous cracks when completed and made effective scrubbing difficult, if not impossible. Shortly after their installation three cases of crab lice were discovered and although very radical anti-louse measures were carried out, the command was not freed of these vermin until the latrine covers mentioned were burned and a cover which could be used in a squatting position only was substituted. The soles of the shoes afford the point of rest instead of the naked buttocks, and the only other contact with the appliance is where the lid rests against the outside of the clothing, at the back. These latrine covers, which were installed in May, are at this date, November 26, 1917, still in use.

There has been one case of pediculosis (crab lice) at Fort Tilden during

[1] Lucas: A Straddle Trench Cover: MILITARY SURGEON, December, 1916.

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the last seven months. This was a very exuberant infestation indeed and was apparently of some days' duration before discovery, judging by the number of vermin and nits. Two weeks since the last physical inspection, had elapsed when they were discovered and, if a few of these vermin were not present and overlooked at that examination, they must have been contracted very shortly afterwards. From past experience it is my opinion that this degree of infestation could not have remained confined to the single individual, if any ordinary common privy seat had been used under the existing conditions at this post. Not another case has appeared after twenty-four days, during which time two physical inspections have been made, and during which time delay in construction of the sewerage system, and cold weather has made bathing at this post almost impossible, at least in so far as the bathhouse is extemporaneous concerned.

Description of the Squat Latrine Cover.—Cuts of the cover, as previously described, are given in *Military Hygiene*, Havard, third revised edition, 1917, page 639, and THE MILITARY SURGEON, December, 1916, page 644. It was emphasized in my previous report (MILITARY SURGEON) that it is the principle of *no seat* that is the essence of the thing, and that many contrivances may be made to accomplish this equally well. My object in providing cuts is to exhibit forms of covers which have stood practical tests and developments to meet local conditions (see Figs. 1, 2, 3). Time, material and, at first, interest in the affair did not warrant as substantial construction of the covers requested, as desired, at Fort Tilden. Four boards of 6 inches, 1 inch, and 10 feet dimensions were supplied for each of the three companies, with sufficient 2 by 4 inch material, nails, hinges, and a handy man with tools. With these covers were constructed presenting five openings, about 2 feet long and 12 inches wide, with a 6-inch foot board extending along each side, held together and supported by the 2 by 4 stringers, which were placed so as to act as a stop at one end of the lids, and afford fastenings for two hinges at the other ends. An extra block of 2 by 4 was placed across the hinge anchors so as to give added strength to their fastenings and at the same time prevent the lids from opening to an angle beyond that which would cause them to close by gravity when disused. However, it was soon discovered that such great strain was exerted on the hinges and blocks by the leverage of the body weight, thrown back against the under side of the cover, when in use, as to loosen the fastenings. Sergt. Wm. D. Pitchford, 10th Company, C. A. C., S. N. Y., thereupon improvised the upright supports which are exhibited in the drawing and pictures. These covers now remain in place and have required slight repair to the present date, November 26, 1917. The pits are dug in the sand which tends to cave, for which reason the covers were widened by two boards on each side. These were placed over the regulation deep latrine pit which was subsequently built and cased up with boards. The pit of each of the three companies lasted for about four to six weeks, before it was necessary to provide others.

These covers reduce greatly the labor and attention ordinarily required for latrine policing. It is possible that some of the covers have been thoroughly scrubbed once or twice in the several months; nothing has been suggested as to this by the surgeon. The pictures were taken after months of use and exhibit

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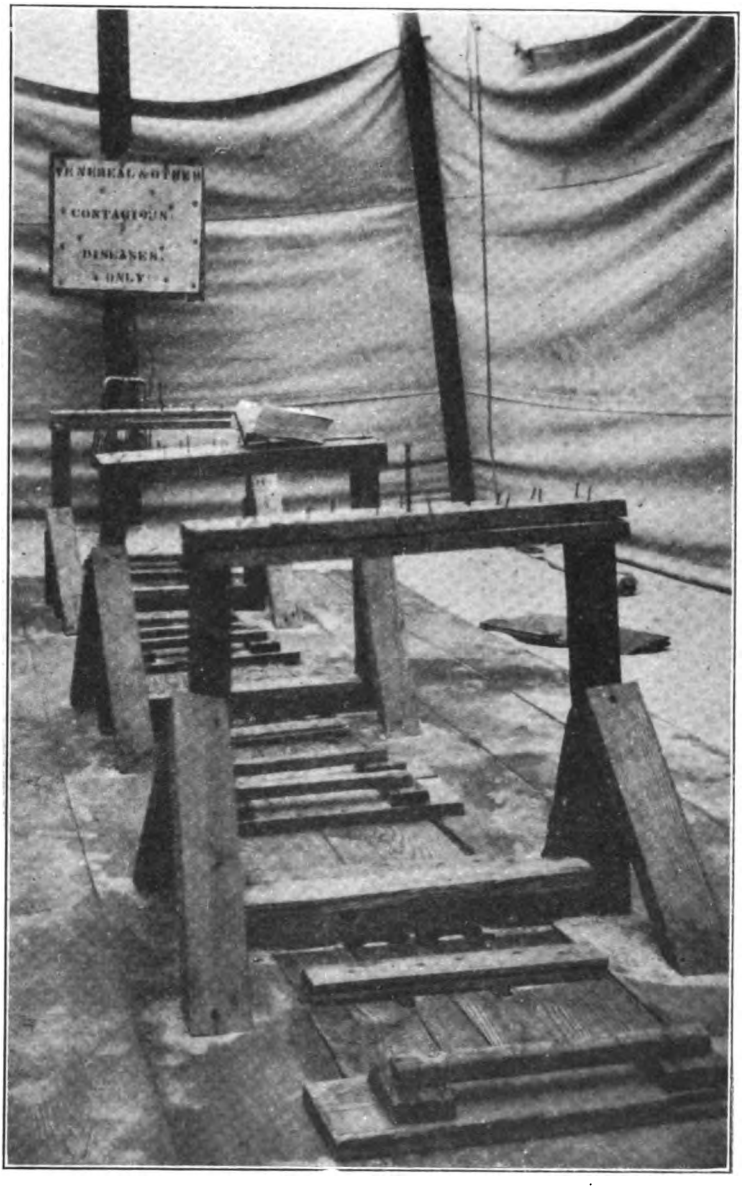

LUCAS LATRINE, COVERS CLOSED

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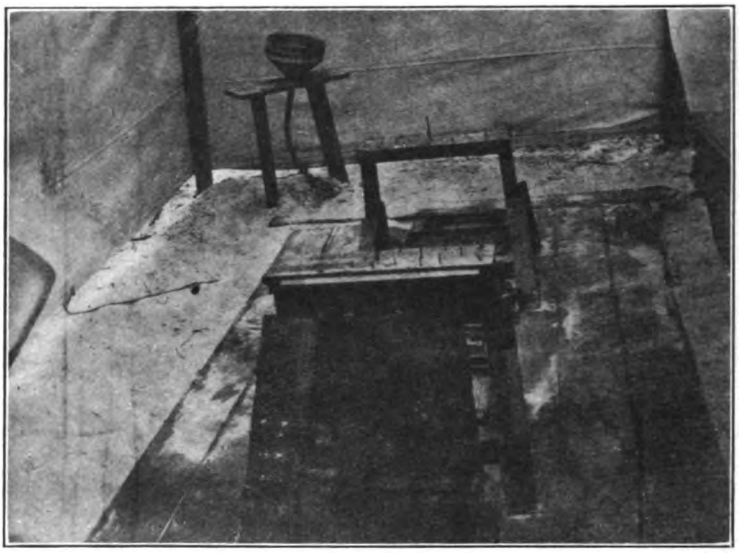

LUCAS LATRINE, COVER RAISED. THIS ALSO SHOWS WIND

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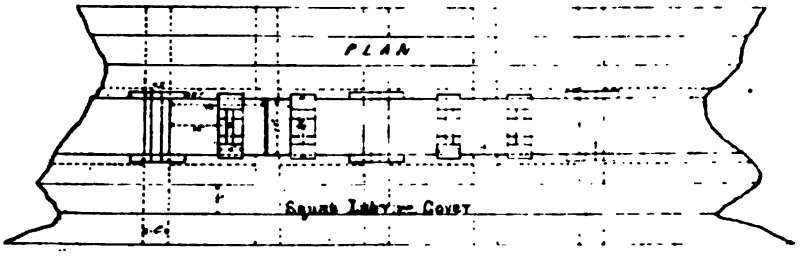
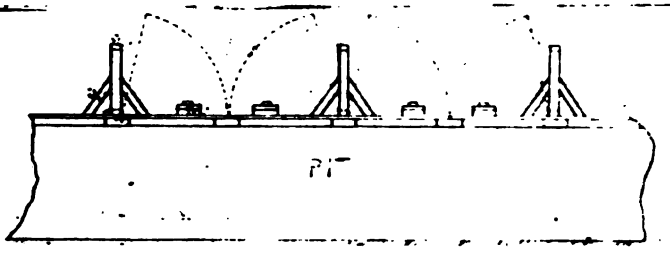
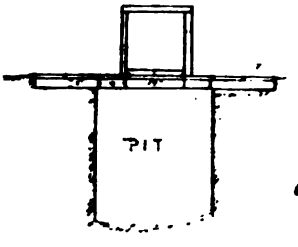




LONGITUDINAL SECTION



CROSS SECTION

Scale 2' to 1"

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a fair representation of the condition they are in at this time. It is desirable to provide a separate urinal, for which purpose large gasoline funnels and a length of garden hose have answered admirably, one of which is shown in Fig. 3.

Under conditions as found at Fort Tilden, sand or earth, when piled upon the foot boards, is constantly kicked into the pit when it is being used, thereby covering the dejecta and giving a double automatic working guard against odors and flies.

Now that the semi-permanent bath house, with sewerage and running water and so-called modern privy seats, is almost completed at this post, we shall observe with interest whether this equipment is in the direction of better sanitation or otherwise.[3] While the modern toilet seat may be maintained in a perfectly hygienic condition, the question is, under the conditions which are prevalent in cantonments, will this be done? As to preference of the men for the seated and squatting position on the toilet, the presence of the fender rail which is necessary to force those using latrines to sit upon them, is evidence sufficient. I regret that provision, even in the new bath house at this post, of facilities so that the act of defecation could be accomplished in the squatting position, is not provided. I dare say that such provision would not only have been more economical, simple of installation and sanitary, but also preferred by the men. The few murmurs of dissent, when all seats were abolished from latrines on the reservation, quickly subsided when the reason for this innovation was understood. Even now, when there have been for the last months several privies with seats reinstalled on the reservation, I observe that the men purposely avoid them and go to the squat latrines, especially so when it is understood that Pvt. John Doe has developed a case of gonorrhea.

This report is made for two reasons: (1) It was not made clear in my first publication that the principle of squatting was the essential point, nor was sufficient emphasis placed on the applicability of the principle to all forms of public latrines. It is now apparent that, had my first article been entitled "A Squat Latrine Cover," instead of a "Straddle Trench Cover," the legend would more scientifically have portrayed the subject, and a certain amount of misunderstanding have been avoided. (2) It is apparent that this principle will remain only of local interest and effect until the Quartermaster Department becomes interested. In order to more readily interest this department of practical men, it may be well to mention that the top alone of the Quartermaster Corps standard latrine cover would afford approximately all of the material necessary for the construction of the entire squat latrine cover. A glance at the drawing of the Q. M. C. standard latrine cover is sufficient to show that substitution of the "squat" cover will save 75 per cent in lumber and furnish a far more sanitary appearance.

[3] A sergeant, who is a married man of excellent reputation, discovered that he was infested with crab lice within two weeks after the above-mentioned bath house was completed. There is now on the average 2 per cent of the command found to be infested with this vermin at each semi-monthly physical inspection. This, in spite of the fact that the commander became very much interested in prevention of such conditions at this post, and ordered two men as attendants to be in the bath house at all times, and that the officer of the day inspect the bath house at least five times in twenty-four hours to see that proper police of the seats is carried out. Of course, isolation of the infested cases is promptly instituted, the patients are shaved of all hair in the pubic and axillary regions, kerosene or mercurial ointment is applied, and frequent soap baths given.

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A SURGICAL DUGOUT AND HOW TO VENTILATE IT[1]

Capt. Joseph Leidy, M. R. C., has devised a "dugout" and suggests the principle of ventilation and purification of air by the vacuum method, with view to gas protection, by using a slow suction fan, worked by the hand of an attendant with, or without, the use of an installed canister containing the neutralizing chemicals. The fan is placed in a pit before the blanket door at the front of a dugout as shown in the plan. Captain Leidy remarks that the plan was worked out by Lieut. Geo. Murphy, 105th Engineers, and suggests that this "becomes an additional means of protection to the surgeon and his assistants in the event of injury to their gas masks, or when necessary to change or repair a mask in an emergency;" but in no sense is to be considered as a substitute for the mask and blanket door.

The writer has been led to this suggestion by reason of the fact that neither the French nor English instructors with the division with which he is serving have offered anything along these lines to meet an emergency. He adds in a note, "The trifling expense of the proposed system is not an unimportant factor in its installation, as such an apparatus could be made by a company carpenter."

It would appear that, like most things under the sun, this is not a wholly untried proposition, at least in part, as the French experimented with it, using 3 feet thicknesses of layers of earth and charcoal as the filtering media. Our Gas Defense Service says of the blanket door, when "properly made and there is a blanket inside of the first blanket, forming a vestibule, there is practically no leakage of gas and surgeons can work for hours. The slight quantities of gas which reach the entrance are mostly absorbed by the earthen walls of the passageways. It is possible for the air to become 'stale' in the dugout, but there is generally enough ventilation to provide sufficient air for good respiration."

Captain Leidy thus describes the operation of his dugout and trench ventilator:

> The accompanying print shows the ventilator at the entrance of a dugout, where it is assumed medical or other attention will require work without a mask and in territory where gas is present.
>
> The principle of operation is to produce a draft through the pit at the bottom of the stairway which would be the point at which gas would collect. The gased air from and above the pit would then pass through the pipe and up the ventilator; a bypass is provided in the pipe line, where air can be sent through a canister containing chemicals to absorb the gas, thus furnishing pure air for the room.

[1] With one illustration.

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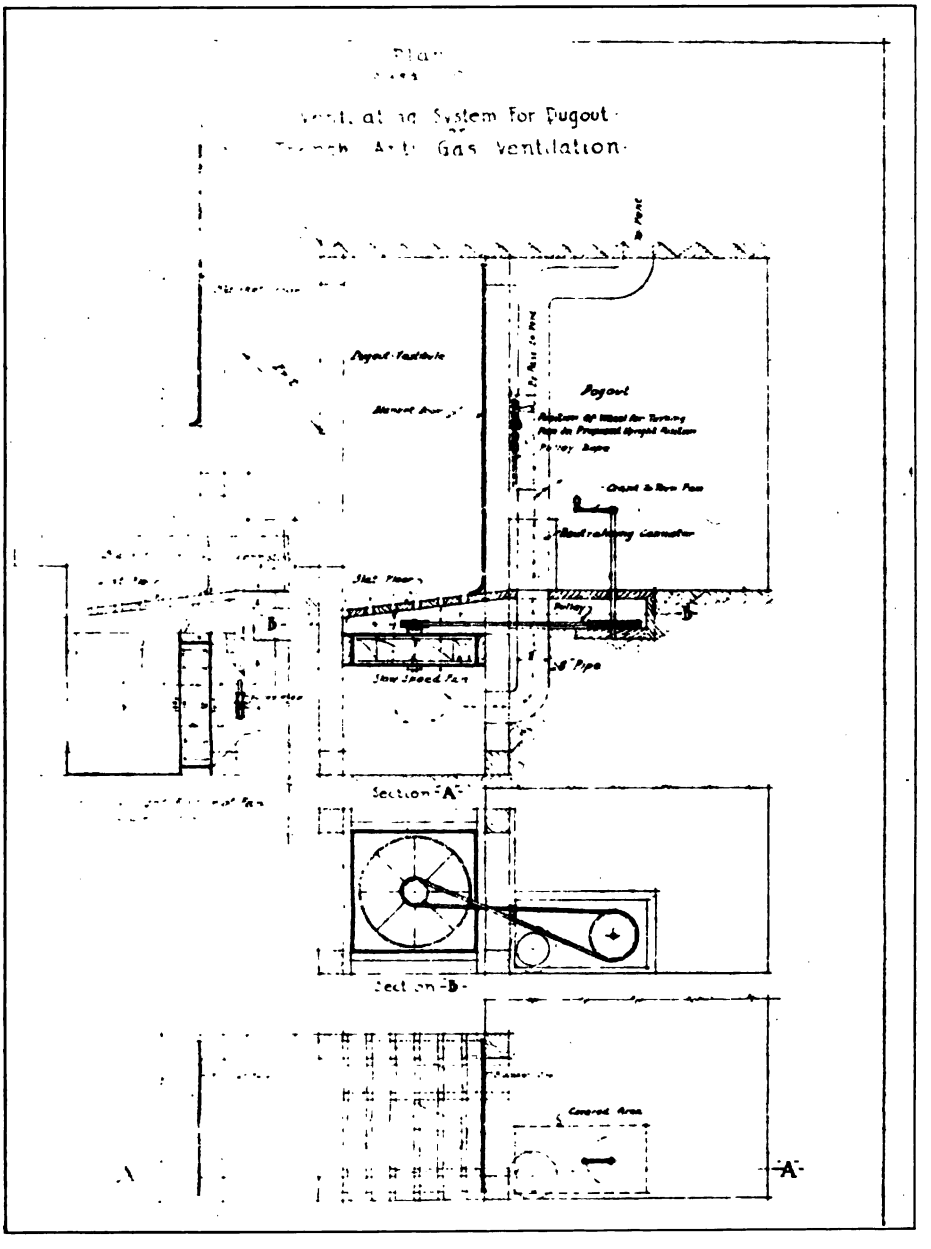

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The size of the fan and the pipe leading to the ventilator will be determined by the sectional area of the entrance and should be of a size sufficient to take care of an emergency—in other words, to be able to exhaust all the air which could pass the entrance.

The exhaust fan would be of light construction and produce the draft at a speed which could be operated by hand, as the plan shows, where power could not be obtained.

The vertical position of the fan is best suited for hand drive and offers advantages against dirt and refuse, carried on shoes from the trenches, passing through the fan.

The sketch was prepared to show the principle of operation and sizes would be best determined by experiment.

AN HISTORICAL EXHIBIT OF MILITARY MEDICINE

The opening of the exhibition of the collection of war specimens of the Royal Army Medical Corps at the Museum of the Royal College of Surgeons, London, on October 11, 1917, calls to mind the various collections of this kind made in the immediate past, and affords an unusual incentive to activities on the part of our own medical establishment as our forces come to play a more and more definite part on the Western front. We may recall with pride that one of the earliest—certainly the earliest large collection of this kind—originated with the circular issued by Surgeon General Hammond on May 21, 1862, establishing an Army Medical Museum at Washington and directing medical officers "diligently to collect and forward to the office of the Surgeon General all specimens of morbid anatomy, surgical or medical, which may be regarded as valuable, together with projectiles and foreign bodies removed, and such other matters as may prove of interest in the study of medicine and surgery." On January 10, 1863, Surgeon John S. Brinton, then Curator of the Army Medical Museum, was already in position to publish a catalogue of 959 specimens of gunshot fracture, 105 pathological specimens, 269 missiles, and 29 patterns of bayonets. A 664-page catalogue of the surgical section, prepared by Captain (now General) Alfred A. Woodhull, was published in 1866. The Museum now contains 47,681 specimens (June 30, 1917), and active preparations are now being made for the reception and cataloguing of specimens from the front to be collected by a special unit.

In 1810, some fifty-two years before our own Army Medical Museum was founded, British medical officers began to collect pathological specimens at Portsmouth, and, during 1810–11, about fifty preparations were put up at Hilsea Hospital. Nothing more was

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done until 1816, when another beginning was made at York Hospital, Chelsea. At this time nearly all the Portsmouth preparations were found to be spoiled. The Chelsea preparations were then removed to the General Hospital at Fort Pitt, Chatham, and with this date (1816) the Museum of Royal Army Medical Department properly began. In 1833, a 269-page catalogue of the specimens, arranged in physiological series, was published. It was followed by later catalogues of 1838 (zoological specimens) and 1845 (pathological specimens). The museum was subsequently removed to Netley, and a catalogue of the pathological specimens was published in 1890 (3d ed., by Sir William Aitken, 1892). A catalogue of the Museum of Military Surgery, at Netley, was published in 1867. These collections are now in the Museum of the Royal Army Medical College, Millbank.

The present London exhibit occupies the three rooms in the Museum of the Royal College of Surgeons, which, in time of peace, contained the unique preparations made by John Hunter, now happily stored in sundry cellars, out of harm's way. The war exhibit is fittingly designed to be of the utmost practical use for object-teaching in military medicine and surgery. On entering Room 1, the first thing seen is the collection labeled "Means of Protection," *i. e.*, metal helmets, breast-plates, and various devices for gas defense. Then come the effect of bullets of high velocity on the skull, including bilateral injuries from the same bullet; gutter wounds and concealed injuries of the internal plate of the skull; fractured jaws, with dental splints attached; fissures of the vertebrae by explosive bullets; gunshot injuries of the ribs, sternum, upper extremities, sacrum, and pelvis; the "butterfly," or X-shaped fractures of the femur; injuries of the lower extremities, and multiple injuries. These specimens are all from the present war.

In Room 2, examples of gunshot wounds from Corunna, Waterloo, the Crimean, Austro-Prussian and Franco-Prussian wars are displayed, the wounds from shrapnel and shell wounds and their septic inflammatory sequelae being the same as now. The shattering, expansive, "explosive" effects of high-velocity missiles first appear in specimens from the Soudanese campaign of 1898. Near this historical series are specimens of modern rifle ammunition, Sir Victor Horsley's models showing the track of high-velocity bullets in soft clay, specimens of wounds of entrance, wounds of exit, wounds at various stages of healing or sepsis, the new wrinkle of "excised wounds," the manifold visceral lesions, the sequelae of wounds, and

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specimens of successful surgical operations; also specimens of the drowning of the lungs by effusion from "gassing," the renal lesions in trench nephritis, and the gas gangrene produced by the Welch bacillus (*B. aërogenes*). On a screen nearby are the accurate bedside drawings of war wounds in pen and brush by Sergt. A. K. Maxwell, showing, among other things, the appearance of the muscles in various stages of gas gangrene.

Room 3 is an important exhibit of the graphics of war-time surgery. It contains Sir Charles Bell's drawings of wounds by gunshot, cannonshot, and *armes blanches* from Waterloo; Col. F. M. Caird's off-hand sketches of trench-foot, guillotine amputations and the effects of Yperite (from France), with plaster-casts, photographs, radiograms, and wax models of jaw-surgery, orthopedic surgery, models of fracture splints, casts of flat foot, deformities from nerve lesions and adaptation of stumps to artificial limbs. The collection is instructive as to the lines that may be taken in organizing our own graphic unit. The entire exhibit, as stated, is eminently practical in tendency, designed to orient medical officers as to conditions, rare in civil life, which may be encountered and must be dealt with, *e. g.*, concealed wounds, migration of bullets into the heart and elsewhere *via* the blood channels, fatal termination of fractures of the neck from diving, which might have been prevented by proper handling.

Another phase, that of books, pictures, and specimens illustrating the cultural development of military medicine, appears in the remarkable catalogues of the exhibitions given at Dresden (1911) and at Berlin at the opening of the war (1914). The historical section of the International Hygienic Exposition at Dresden in 1911 was a vast assemblage of some 20,394 items, representing every cultural phase of public and private hygiene, from remote antiquity down. Military medicine and hygiene were especially featured. Babylonian tents, Phoenician transport ships, a walled camp at Nineveh, vultures as natural scavengers of the battlefield, with burial of the dead in a common grave; bandaging scenes from Greek vases and Roman columns were shown, and, in the later period, the beginnings of definite uniforming in the sixteenth and seventeenth centuries; the *justaucorps* coats; the hot, heavy helmets, shakos and wigs; the narrow collars and chest-constricting knapsacks; camel transportation of the wounded in Egypt (1792); the fitful appearance of a "Red Cross" agreement at the Bridge of Lodi (1796); a bandaging scene at Essling (1805); transportation of the

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wounded in the Napoleonic wars (1805–1815); a traveling kitchen (1806); three soldiers to a bed (1806); a ration list of 1810 (2 pounds bread, 2 measures of beer, 1 pound meat per man *per diem*); swimming schools for soldiers (1820–1826); an ambulance wagon of 1824; heavily wadded uniform coats of 1830–1850; sieve ventilation in barracks (1843), etc.

At the Berlin exhibit (1914), many objects illustrating field and naval sanitation, prevention of tuberculosis, military radiology, field dentistry, the technics of nursing, circulating libraries for soldiers in hospital, the care of war cripples, evacuation and care of the wounded, were contributed by the German military establishment and various commercial firms. The historical section comprised a number of figurations of wounded warriors from antique vases, statuary, frescoes, and sarcophagi; camp and battle scenes by mediaeval and modern artists; also different kinds of bandages from 1813 on, field-chests, sutures, letters and cacolets, military hospital appointments, surgical instruments, and artificial limbs.

Among the graphic items were a scene of carrying the wounded from a battlefield from an old Greek sarcophagus at Stamboul; Andrea della Croze's picture of the extracting of a bullet during a battle with the Turks (1605); the pictures of Ambroise Paré on the battlefield by E. Hammann and L. Matout; the fantastic war scenes (*Los Desastres de la Guerra*) etched by F. Goya y Lucientes; Horace Vernet's "Wounded Soldiers," and many pictures of military medicine by German artists, such as the etchings of Chodowiecki, A. von Menzel's "Feldschers and Hussars," or M. von Schwindt's "Bandaging of a Wounded Soldier." There were also printed placards giving passages from the Iliad on the care of the wounded, the mandates of Queen Isabella of Spain for the maintenance of her field hospital (1487), Gersdorff's dictum, "No wine to the wounded" (1551), which marks a distinct break with the earlier practice of giving stimulating "wound-drinks," and placard citations showing the existence of five precursors of the Geneva Convention between 1743 and 1864.

In 1916, a collection of pathological specimens from the present war was instituted at the École d'Application du Service de Santé Militaire at Val de Grâce, as an annex to the Historical Museum of the Service de Santé, established at the same school in the late eighties. The latter consists of a large collection of historical archives, tablets, inscriptions, extracts from dispatches and pictures, with clay models of military posts and dressing stations,

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model plans of hospitals and hospital trains, and specimens of stretchers and splints. The Pirogoff Museum, at Petrograd, established in memory of the great military surgeon who, in the words of Senn "was to Todleben what Larrey was to Napoleon Bonaparte," is mainly a repository of Pirogoff relics.

The glass-case exhibit of historical items recently prepared at the instance of Col. Champe C. McCulloch, Librarian, S. G. O., in the Library Hall, Army Medical Museum, is necessarily of more modest proportions, being restricted to items actually in the Surgeon General's Library. While the resources of the Library have not been greatly taxed thereby, it is believed that this small array of items affords a good illustration of the ups and downs of military medicine in the past and the present, for visiting medical officers. A catalogue raisonné of the same is subjoined.

I. Books illustrating the history and progress of Military Medicine:

ARNOLD OF VILLANOVA: Tractatus de regimine castra sequentium. 13th Century. *In his:* Praxis medicinalis. 4°. Leyden, 1786–87.

VON PFOLSPEUNDT (Heinrich): Buch der Bündth-Ertznei (1460). (Edited by H. Haeser and A. Middeldorpf). 8°. Berlin, 1868.

BRUNSCHWIG (Hieronymus): Buch der Wund-Artzeney. 4°. Strassburg, 1497.

VON GERSSDORFF (Hans): Feltbuch der Wund-Artzeney. 8°. Strassburg, 1526.

PARÉ (Ambroise): La manière de traictes les playes faictes tant par hacquebuts, que par fleches. 8°. Paris, 1552.

GALE (Thomas): An excellent treatise of wounds, made with gonneshot. 4°. London, 1563.

CLOWES (William): A prooved practise for all young chirurgians concerning burnings with gunpowder and wounds. 8°. London, 1591.

FABRY (Wilhelm) VON HILDEN: Feldt Artzney-Buch von Kranckheiten und Schäden. 12°. Basel, 1615.

————His experiments in Chyurgerie. 4°. London, 1643.

MINDERER (Raimund): Medicina militaris. 12°. Ingolstadt, 1620.

COBER (Tobias): Observationum medicarum castrensium hungaricarum decades tres. 8°. Helmstadt, 1685. Contains the first note of the relation of pediculosis and typhus fever.

VON GEHEMA (Jan Abraham): Der wohlversuchte Feld-Medicus. 16°. Rostock, 1689.

PURMANN (Matthias Gottfred): Der rechte und wahrhaftige Feldscher. 12°. Frankfurt u. Leipzig, 1690.

Morbi castrenses: Various treatises of the 18th Century, bound in one volume. 4°.

PRINGLE (Sir John): Observations on the diseases of the army in camp and garrison. 8°. London, 1752.

DE MEYSEREY: La médecine d'armée. 12°. Paris, 1754.

VAN SWIETEN (Gerhard): Kurze Beschreibung und Heilungsart der Krankheiten, welche am öftesten in dem Feldlager beobachtet werden. 12°. Wien, Prag u. Triest, 1758.

BILGUER (Johann Ulric): Diss. inaug. med.-chir. de membrorum amputatione rarissime administranda aut quasi abroganda O. 4°. Halae Magdeb, 1761.

BROCKLESBY (Richard): Economical and medical observations in two parts, from the year 1758 to the year 1763, incl. etc. 8°. London, 1764.

RAVATON (Hughes): Chirurgie d'armée, ou traité des plaies d'armes à feu et d'armes blanches. 8°. Paris, 1768.

COLOMBIER: Code de médecine militaire pour le service de terre. 12°. Paris, 1772.

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Group of books and pamphlets relating to the medical conduct of the War of the Revolution:

Rules and articles for the better government of the troops, raised or to be raised and kept in pay by and at the expense of the Twelve United Colonies of North America. 8°. Philadelphia, 1775.

Jones (John): Plain concise practical remarks on the treatment of wounds and fractures. 8°. Philadelphia, 1776.

Van Swieten (Gerhard): The diseases incident to armies with the method of cure, translated from the original by J. Ranby. 8°. Philadelphia, 1776.

Morgan (John): A vindication of his public character in the station of Director-General of the military hospitals and Physician-in-chief to the Continental Army. 8°. Boston, 1777.

Rush (Benjamin): Directions for preserving the health of soldiers, addressed to the officers of the Army of the United States. 8°. (Philadelphia, 1777.)

Brown (William): Pharmacopoeia simpliciorum et efficaciorum in usum nosocomii militaris ad exercitum Foederatarum Americae civitatum. 8°. Philadelphiae, (1778).

Thacher (John): A military journal during the American Revolutionary War from 1775 to 1783. 8°. Boston, 1827.

Hunter (John): Observations on the diseases of the Army in Jamaica. 8°. London, 1788.

————Treatise on the blood, inflammation and gunshot wounds. 4°. London, 1791.

Percy (Pierre-François) le Baron (1754–1825). Manuel du chirurgien d'armée ou instruction de chirurgie militaire. 8°. Paris, 1792.

Blair (William): The soldier's friend, or, the means of preserving the health of military men. 16°. London, 1798.

Larrey (Dominique Jean) le Baron. Mémoires de chirurgie militaire et campagnes. 4v. 18°. Paris, 1812–17.

Goercke (Johann): Kurze Beschreibung der bei der Königl. Preuss. Armée stattfindenden Krankentransportmittel für die auf dem Schlachtfelde schwer Verwundeten. 4 copperplates. 8°. Berlin, 1814.

Guthrie (George John): On gunshot wounds of the extremities requiring the different operations of amputation. 8°. London, 1815.

Mann (James): Medical sketches of the campaigne of 1812–14. 8°. Dedham, 1816.

Beaumont (William): Autograph letter. November 1, 1825.

Cheyne (John): Letter to George Renny, Esq., M.D., Director General of Military Hospitals in Ireland, etc., on the feigned diseases of soldiers. 8°. Dublin, 1826.

Dupuytren (Guillaume): Traité théorique et pratique des blessures par armes de guerre. 2v. 8°. Paris, 1834.

Gavin (Hector): On the feigned and factitious diseases of soldiers and seamen. 8°. Edinburgh, 1838.

Luard (John): A history of the dress of the British soldier. 8°. London, 1852.

Stromeyer (Ludwig): Maximen der Kriegsheilkunde. 8°. Hannover, 1855.

Tripler (C. S.). Manual of the medical officer of the Army of the United States. Part I. Recruiting and the inspection of recruits. Cincinnati, 1858.

Group of books published in aid of the medical conduct of the Civil War. Of these books, only the flexibly bound surgical handbook of Stephen Smith (1862) passed through more than one edition, reaching its fifth edition in 1863.

Gross (Samuel David): A manual of military surgery. Philadelphia, 1861.

Tripler (Charles S.) and Blackman (G. C.): Handbook for the military surgeon. Cincinnati, 1861.

Chisholm (J. J.). A manual of military surgery for the use of Surgeons in the Confederate Army. Charleston, 1861.

Woodward (Joseph Janvier): The hospital steward's manual. Philadelphia, 1862.

————Outlines of the chief camp diseases of the United States armies. Philadelphia, 1863.

Smith (Stephen): Handbook of surgical operation. New York, 1862.

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BARTHOLOW (Roberts): A manual of instructions for enlisting and discharging soldiers. Philadelphia, 1863.
HAMMOND (William Alexander): A treatise on hygiene, with special reference to the military service. Philadelphia, 1863.
MITCHELL (S. Weir), MOREHOUSE (G. R.) AND KEEN (W. W.): Gunshot Wounds and other injuries of the nerves. Philadelphia, 1864.
GREENLEAF (Charles R.): A manual for the medical officers of the United States Army. Philadelphia, 1864.
WAR DEPARTMENT, *Surgeon General's Office.* Circular No. 6. Reflex paralysis. (By S. Weir Mitchell, G. R. Morehouse and W. W. Keen, Jr.) Washington, 1864
Confederate States Medical and Surgical Journal. v. 1-2. Richmond, 1864-65.
WAR DEPARTMENT, *Surgeon General's Office.* Catalogue of the Surgeon General's Office Library. October 23, 1865. Washington, 1865.
LETTERMAN (Jonathan): Medical recollections of the Army of the Potomac. New York, 1866.
WAR DEPARTMENT, *Surgeon General's Office.* Catalogue of the surgical section of the United States Army Medical Museum. Prepared by Alfred A. Woodhull. Washington, 1866.
DA COSTA (Jacob M.). Observation on the diseases of the heart noticed among soldiers. 8°. New York, 1867. In: Flint's Contributions relating to the causation and prevention of disease, 360–382.
FLINT (Austin): Contributions relating to the causation and prevention of disease and to camp diseases. New York, 1867.
WAR DEPARTMENT, *Surgeon General's Office.* List of works on military surgery in the Library of the Surgeon General's Office. August 20, 1869. Washington, 1869.
————Circular No. 4, 1870. A report on barracks and hospitals. By John S. Billings. Washington, 1870.
MITCHELL (S. Weir): Injuries of nerves and their consequences. Philadelphia, 1872.
WAR DEPARTMENT, *Surgeon General's Office.* Circular No. 8, 1875. A report on the hygiene of the United States Army. By John S. Billings. Washington, 1875.
DUNANT (J.Henri): Un souvenir de Solferino. 3. ed. Genève, 1863.
PIROGOFF (Nikolai Ivanovich): Grundzüge der allgemeinen Kriegschirurgie. 8°. Leipzig, 1864.
LONGMORE (Sir Thomas): A treatise on the transport of sick and wounded troops. 8°. London, 1868.
VON ESMARCH (Friedrich): Der erste Verband auf dem Schlachtfelde. Kiel, 1869.
————Ueber Vorbereitung von Reserve-Lazaretten. Berlin, 1870.
————Handbuch der kriegschirurgischen Technik. 8°. Hannover, 1877.
VIRCHOW (Rudolf): Ueber Hospitäler und Lazarette. Berlin, 1869.
————Ueber Lazarette und Baracken. 8°. Berlin, 1871.
————Die Fortschritte der Kriegsheilkunde. Berlin, 1874.
LISTER (Joseph): Observations on ligatures of arteries. 8°. Edinburgh, 1870.
————On the effects of the antiseptic system of treatment upon the salubrity of a surgical hospital. 8°. Edinburgh, 1870.
KLEBS (Edwin): Beiträge zur pathologischen Anatomie von Schusswunden. Leipzig, 1872.
BILLROTH (Theodor): Chirurgische Briefe aus den Kriegs-Lazarethen in Weissenburg und Mannheim, 1870. 8°. Berlin, 1872.
VON LANGENBECK (Bernhard): Chirurgische Beobachtungen aus dem Kriege. 8°. Berlin, 1874.
LAVERAN (Alphonse): Traité des maladies et épidémies des armées. Paris, 1875.
TONER (Joseph Meredith): The medical men of the Revolution with a brief history of the Medical Department of the Continental Army. 8°. Philadelphia, 1876.
LONGMORE (Sir Thomas): Gunshot injuries. 8°. London, 1877.
WOODHULL (Alfred A.) Observations upon the medical department of the British Army, made in 1891. St. Louis, 1894.
KÖHLER (Albert): Grundriss der Geschichte der Kriegschirurgie. 8°. Berlin, 1901.
PILCHER (James Evelyn): The Surgeon Generals of the Army of the United States of America. Carlisle, Pa., 1905.
LA GARDE (Louis A.): Gunshot injuries. New York, 1914.
CANADA. Regulations for the Canadian Medical Service, 1914. Ottawa, 1915.

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GREAT BRITAIN. Army Medical Department. Memorandum on the treatment of injuries in war, based on experience of the present campaign. July, 1915. 16°. London, 1915.
LELEAN (P. S.): Sanitation in war. 8°. London, 1915.
SHIPLEY (A. E.): The minor horrors of war. 8°. London, 1916.
HAVARD (Valery): Military Hygiene. 8°. New York, 1917.
MUNSON (Edward L.): The Principles of Sanitary Tactics. 8°. Menasha, Wis., 1917.
————The Soldier's Foot (1912). 8°. Menasha, Wis., 1917.
JONES (Robert): Notes on military orthopedics. 8°. London, 1917.
CARREL (Alexis) AND DEHELLY (G.): Le traitément des plaies infectées. Paris, 1917.

II. Carte de visite photos of celebrated medical officers: Sir Thomas Longmore, Baron F. H. Larrey, Surg. Gen. Merchle (Belgium), B. von Langenbeck, A. von Bardeleben, W. Roth, F. von Esmarch, H. von Helmholtz, E. Gurlt.

Civil War Group:

J. S. Billings, C. S. Tripler, A. A. Woodhull, J. J. Woodward, Jonathan Letterman, T. A. McParlin, J. K. Barnes, S. Weir Mitchell, S. A. Green.

III. Photographs illustrating the history of Military Medicine.

1. Bandaging scene from an electron vase of the 4th century, B. C., excavated at Koul-oba in the Crimea. (Hermitage, Petrograd.) Period of non-specialization. (The army surgeon was also a warrior, possessing medical knowledge, transmitted by his ancestors.)

2. Plan of the Roman military hospital (Valetudinarium) at Carnuntum, near Vienna: first period of construction (beginning of 1st Century, A. D.). (Beginnings of organized medico-military administration. Each tactical unit and each war-ship had army surgeons).

3. Plan of Roman military hospital (Valetudinarium) at Novaesium (Neuss, Rhenish Prussia) (end of 1st Century, A. D.).

4. Plan of Roman military hospital (Valetudinarium) at Carnuntum, near Vienna; showing an entire change in design and construction; second period of construction (*circa* 167 A. D.).

5. Application of a bandage; relief from the Pillar of Trajan, Rome, representing the first battle with the Dacians at Tapae (101 A. D.). (In this period, each Roman legion had a complement of 20 army surgeons, uniformed like the rest of the troops, with the exception that the shield was not carried.)

6. Arrow-wounds of head, wrist and calf of leg, from Brunschwig's Book of Wound-Surgery. (Strassburg, 1497.)

7. Amputation, from Gersdorff's Field-Book of Wound-Surgery (Strassburg, 1517), showing constriction of blood-vessels above and below the site of election.

8. Extraction of an arrow in the field, from Gersdorff's Field-Book of Wound-Surgery (Strassburg, 1517).

9. Mutilation of prisoners and wounded after a battle (from Gottfried's Chronik, 1629).

10. Amputation, from Purmann's Chirurgia curiosa, showing the tight-waisted *justaucorps* coat worn by the 17th century army surgeon. (Actual specimens of this uniform were exhibited at Dresden in 1911.)

11. Amputation from Heister's Surgery (1718), showing the *justaucorps* coat worn by army surgeons in the 17th century.

12. Monument to Surgeon General Goercke (1750-1822), founder

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of the Medico-Chirurgical Pepinière (1785), now the Kaiser-Wilhelms Akademie, Berlin. His grave is in the garden of the Academy.

13. Death of Marshal Lannes at the battle of Essling (May 29, 1809). He is supported by Napoleon himself, while Larrey attends to the shattered limbs.

14. Return of the wounded from the battle of Sidi-Mered (Algerian War, 1842) showing mule-transportation by means of litter and cacolet (pannier).

15. Médecin-inspecteur Sedillot, director of the École impériale de médecine militaire at Strassburg (1860-66).

16. Uniform of a pupil (medical cadet) at the École impériale de santé militaire, Strassburg 1861.

17. École impériale du service de santé militaire, Strassburg, 1856.

18. Photographs showing modes of bandaging the wounded (French Army).

19. Photographs showing modes of transporting the wounded (French Army).

20. Photograph of protective helmet (French Service).

21. "Les soldats de Reuilly." Post-card photographs of methods of reeducation of the blind. (France.)

IV. Objects from the front.

1. First aid packets used in English, French and German services.
2. Cake of ambrine (French Service).
3. Tetanus antitoxin: portable ampoule (German service).

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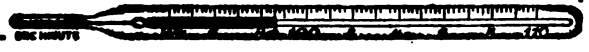

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CURRENT LITERATURE

The Improvement of War Bread by the Neutralization of Ferments in Bran, by Lapicgne and Legendre. Comptes Rendues des Séances de l'Académie des Sciences, t. clxiii, No. 9, 27 Aout, 1917, p. 316. (From "Office Internat. d'Hygiene Publique," t. ix, No. 9, September, 1917, p. 1181.)

The French have, perhaps always, enjoyed an enviable reputation of being the makers of excellent bread. We are, therefore, very apt to pay due attention to an announcement of still further improvement in breadmaking by them.

It has been known for some time that the scaly coverings of grain are not merely inert cellulose protective envelopes, but that they contain soluble ferments acting energetically on all the other panifiable substances which they enclose. The material that lends itself, more especially, for the study of these ferments may be obtained from mills and consists of those substances, intermediate between bran and flour, commonly known as gruel or "recoupettes," still obtained as a by product by certain millers, unable to improve their complicated machinery. This gruel, the color of which varies from gray to rose, is of a distinct acid reaction; when moistened, even with the addition of an antiseptic, such as toluene, these substances ferment energetically; when exposed to the vapors of ammonia, they change their color from brown to citron-yellow; the same color-change occurs on the addition of an alkali and, under the microscope, it is clearly seen that it is localized in the aleuron cells. Finally, the change in color is, likewise, seen in the watery extracts obtained from the gruel (*recoupettes*), and, after this turn in color has taken place, through the action of some alkali, such extracts have lost their noxious acid fermentative powers upon the flour. These principles having been worked out in the laboratory, our authors have endeavored to apply them in bakeries.

For practical as well as hygienic reasons, lime water was used as the alkali and thus several kilograms of bread were made in accordance with the following technic: 4,470 grams of flour à 76 (grain of La Plata) and 530 grams of gruel (*recoupettes*) of the same grain (gruel containing about one-third of bran, so-called); then a leaven was made with 1 kilogram of flour and 90 grams of yeast. While the leaven was in the process of rising, the 530 grams of gruel (*recoupettes*) were treated with lime water until the change in color occured, which took about 1½ liters; the leaven having reached the proper point, a paste was made with the remainder of the flour by first using the gruel, diluted with its lime water, then completing it by pouring ordinary water into it, until the desirable consistency of the paste was attained. The bread thus obtained was scarcely less brown than the ordinary bread made of the same flour but, in spite of the large amount of bran it contained, it was absolutely free from the acrity or tartness possessed by the latter. Other trials were attended by the same excellent results.

It must, of course, be admitted that breadmaking by the use of leaven is in itself a fundamentally favorable condition. The authors have caused to be

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made a lot of breads (190 of 1,400 grams each), with a series of leavens, in the ordinary way except that the gruel, instead of being mixed with the flour, had first been treated as stated above. The results were excellent: bread of a sweet taste and odor, without acidity, and remaining unchanged, while the control-bread became moldy in five days.

It would, therefore, seem perfectly feasible to produce a bread, perfectly acceptable from all points of view, with a minimum of complication of the work and an expense practically nil and with a flour, deprived by the sieve, of but 15 per cent of its weight.

H. G. Beyer.

The Treatment of Diphtheria Bacillus Carriers by Insufflation of Powdered Antimicrobic Serum, by R. Bénard. *La Presse Medicale,* 17 May, 1917, p. 275. (From "Office International d'Hygiéne Publique," tome ix, No. 8, Augun, 1917, p. 1013), and **The Local Treatment of Diphtheria Bacillus Carriers,** by I. Roskam. Archives Medicales Belges, May, 1917, p. 406. (From "Office Internat. d'Hygiène Publique," tome ix, No. 9, September, 1917, p. 1129.)

Bénard, on comparing the results of treatment of bacillus carriers by the usual methods with those obtained by the method of insufflations with antidiphtheritic serum, extolled by the "Institut Pasteur," finds that the latter method is not only much more simple but brings about sterilization much more surely and rapidly than former methods.

The powder has the following composition: antidiphtheritic serum, 10 grams; novarsénobenzol Billon, 0.90 gr.; bezoin, 1 gr.; bismuthum carbonate, 100.00 grams. The insufflations are done three to four times daily.

With 15 cases of diphtheritic sore throat which the author had treated by injections of antidiphtheritic serum and, after their recovery from the disease, subjected to insufflations, their sojourn at the hospital did not exceed one month; in seven of the cases it amounted to less than two weeks. The treatment, therefore, absolutely eliminates convalescent carriers. As for "healthy carriers," out of 14 such isolated cases, 5 were discharged in less than one week, 8 in less than thirteen days and one only at the end of eighteen days.

The author then cites an experience of his, in 1916, at Nevers, where a special school had been formed in which all the juvenile bacillus carriers were collected and treated, amounting to 22 children; these were all discharged, after two negative tests, in 15 days. One of these children had been known as a bacillus carrier for six months and in whom the usual methods of treatment had not succeeded; she was completely free from germs in twelve days.

Roskam confirms the good effects of nasal and pharyngeal insufflations with pulverized antimicrobic serum (*mélange de pastilles* L. Martin of antimicrobic serum, pulverized, of arsénobenzol, of camphor, of talcum and of boric acid). The saving in mean time by the insufflation method, as compared with the usual antiseptic method, is 33 per cent for the convalescents and 59 per cent for healthy carriers.

H. G. Beyer.

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ABSTRACTS FROM THE LITERATURE OF PLASTIC AND ORAL SURGERY

OFFICE OF THE SURGEON GENERAL, UNITED STATES ARMY

Section of Surgery of the Head

(*Concluded*)

PLASTIC SURGERY

1. BRYAN, W. A. Plastic Surgery of the Face. *Brit. Dent. Jour.*, 1916, xxxvii, 229-232.

Traumatism is the most potent cause of failure in plastic and in all other kinds of surgery.

In facial repair, overdo the correction.

Apply no dressing to the wound.

The author refers to Horsley's transplantation of the anterior temporal artery. Flap is cut from the anterior temporal region and the anterior temporal artery with its veins is left attached to the flap and dissected out of its bed as far back as required. Wound closed and source of flap skin grafted if necessary. A new bed is made for the vessels by making an incision which leads from the point of exit of the vessels to the edge of the defect. Vessels placed in incision and covered by suture. Flap sutured in position.

2. BABCOCK, W. W. Osteoplastic Surgery of the Face. *Jour. A. M. A.*, 1915, lxiv, 203.

Transplantation of free fat from patient's abdominal wall. The cutaneous incision need not be large, and should be placed, if possible, at some inconspicuous point. Subcutaneous tissues separated by a knife, and tunneling with blunt pointed scissors. After arresting hemorrhage, bits of fat of sufficient size are introduced and held in the pocket by subcutaneous sutures of fine catgut. Usually undesirable to suture fat in position. The fat is introduced in small portions or strips may be obtained from adjacent subcutaneous tissues. In small defects, local anesthesia may be used.

3. ESSEBER, J. F. Studies in Plastic Surgery of the Face. *Annals of Surgery*, March, 1917.

I. *Use of Skin from the Neck to Replace Face Defects.*—The incision for upper lip-cheek defects vary, according to the size and position of the defect. They have all the same principle, that the facial artery lies in the center of the flap, and the upper part of the incision first rises, then makes a broken curve, passing under the ear and extending more or less on to the neck, according to the size of the defect. The lower end of the cut is always vertical, so as to make the whole flap quite movable. After making the flap as movable as required, it is then turned and placed in the defect. The cut varies according to the presence or absence of hair, and also if the defect extends to the eyelid. A somewhat similar incision is necessary in the mucous membrane of the mouth, commencing at the same place and running in the same direction, but turning before reaching Steno's duct. At the end of this cut is also a sudden vertical incision to facilitate its mobility. The cut in the mucous membrane is not only important for mobilization of the whole flap but also a surplus of mucous membrane is thus supplied for the inside of the new lip. The first part of the cut may split the entire cheek, but farther on it must be gradually less deep for fear of injuring the facial nerve or Steno's duct. Ample nourishment for the flap is supplied by the facial artery. Tension is greatest at the neck. A secondary defect, after the primary defect is closed, will be seen by a gap in the neck. The posterior wound edge is then diminished in length by sewing the edge together at the cut intervals. These stitches can bear great tension. In this manner the back edge is made to approach the front one, till they can be easily sewn together. No part is ever left unclosed.

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The apparent danger of injuring Steno's duct and the facial nerve is very small, if careful technique be used. As no dressing is employed, any disturbance at once becomes apparent. Sometimes small salivary fistulas appear, which heal in a few days, without the use of silver nitrate stick. The latter is to be avoided as it leaves scars. In such cases, after thoroughly cleaning with ether, two drops of collodion are placed on the fistula, and as soon as the liquid is nearly dry, a little cotton is pressed with the finger for some moments on the fistula. If pus has collected under the cotton by the next day, the collodion is taken off until the wound becomes clean. This collodion treatment is repeated until healing occurs. Most of these fistulae heal easily because because they are due to injury of the gland tissue and not of the duct.

II. *Plastic Operations about the Mouth.*—Defects of the lower lip.

The technique consists of taking a more or less highly pointed triangular flap with the pedicle below. The flap is taken either from the naso-labial fold, or also extends higher up between the nose and the cheek. When mucous membrane is required, the cuts penetrate into the mouth, otherwise more or less muscular tissue is included in the flap, according to the requirements for active movement in the under lip. After first complete closure of the naso-labial defect, the flap is ready to be placed in the under lip. The flap is used either to fill a defect, or, if the lip be too short or too immovable, is placed in an incision between the red border of the lip and the skin.

The advantages of this method are the following:

1. The flap contains the entire angular artery.
2. The flap may, if required, supply excellently functioning muscle tissue (levator anguli oris) for moving the under lip.
3. The suture line of the secondary defect disappears exactly in the naso-labial fold.
4. The upper line of the flap always forms the natural vermilion border of the lip. Only the much shortened lower suture line remains visible after the operation.

III. *Epidermic Inlay in Combination with Dental Modelling Composition.*—The bad results of Thiersch skin grafting are largely due to irregular growing together of the skin and the grafts, with the formation of scars in the granulating surface.

Means were sought for applying the Thiersch evenly, and maintaining it immovable under equal pressure for some days on the wound. The Thiersch must be everywhere of the same thickness, and equally stretched on the impression form, before this is placed on the wound. After creating aseptic hollows, by cutting under the normal skin adjoining the wound, and after lifting and exactly filling up this with an accurate mold of dental modelling composition, completely surrounded with Thiersch (the raw surface of the Thiersch outward), the equal pressure is brought about by suturing the incision under firm tension. To prevent infection, the greatest care must be taken in preparing the Thiersch. This must be very thin, and as far as possible free from dead cells which are always infected. Therefore, the inner side of the upper arm only is used, because the skin is thinnest and most elastic there, and the part is prepared thoroughly and most carefully, till the skin is pink everywhere. A Thiersch of suitable size and of even thickness can only be cut with regular success after great practice; one must always get a tough, perfectly transparent piece of skin, the thinner the better, especially when it must replace the mucous membrane.

The types of cases in which this method is serviceable are:

1. Enlargement of the conjunctival sac.
2. Construction of part or entire ear.
3. Enlargement of mucous membrane of the mouth.
4. Enlargement of the mouth cavity.
5. Defect of the hard and soft palate.
6. Covering of various forms of skin flaps.

1. *The enlargement of the conjunctival sac* is often required to make room for an artificial eye. In these cases the eyelid skin is cut parallel to the eye-slit, above or below, according to the case. Scars must generally be removed. After lifting the upper part of the cut, an impression can be taken with the sterilized modeling composition. This, after hardening, is carefully covered in the manner described, with very thin Thiersch, and is then placed in the wound, which is closed under tension. The mold must be made of such size and shape as to produce sufficient tension on sewing the wound together. Before cutting the Thiersch, which only is done when everything has been prepared to receive it immediately, without first placing it in physiological saline solution, the hard mould shold be placed in the hollow and the

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incision pressed together with the fingers, to see if the tension is correct, otherwise the mould can be altered. It is not practical to enlarge it by adding to it, as the joint leaves a line where the Thiersch later falls in. It is better to make a new mould if the first proves too small. It is possible to decrease the size of the mold if too large, by cutting it before it is quite hard, and smoothing the cut portion. Closure under pressure by suture is necessary for two reasons—first, the Thiersch is subjected to evenly distributed pressure which favors rapid healing, and second, possible bleeding is prevented. The hollows are formed by *cutting*, purposely to open the largest number of small blood and lymph vessels, as better healing is thus promoted. By suturing under pressure, the small vessels are all closed—only the large arteries must be clamped or twisted, but not tied, as no foreign substance must remain between inlay and wound. In consequence of the pressure, a primary healing of the suture is not certain, but this is of little consequence. After about two weeks, the conjunctival sac is cut parallel to the eye-slit, and at a point where the inlay is nearest to the surface. The mould is removed and the smoothly healed hollow is joined to the eye-slit in order to receive the artificial eye, which must be inserted immediately, so that the elastic hollow can adapt itself to the form of the prosthesis.

2. *With ear defects*, a longer or a shorter cut, according to the size of the defect, is made exactly along the hair line, behind the ear. The skin in front with the periosteum is raised as far as the ear, and above and below as far as necessary to obtain sufficient tissue for the defect. The mold of modelling composition is made of the hollow behind the flap, and after hardening, covered with Thiersch, replaced, and the wound edges sutured. In all cases in which this method is employed it is important that the bottom of the wound be made as flat as possible so that the Thiersch can be laid quite smoothly on the mold—and as the thin skin is very elastic this can be done without folds, though a fold would not prevent success. In very difficult cases, especially when deep tunnels with small openings are to be covered with epithelium and where the Thiersch-covered mold must be pushed in with difficulty and under pressure, the Thiersch may be stuck on the mold with white of egg. The white of egg disappears quickly and makes it possible to remove the mold after one or two weeks without bringing away the Thiersch with it. In the ear cases the sutures are removed after one week, the cut is again opened some days later, the mold removed, the hollow laid completely open, from behind, and this cut enlarged from above and below, till the flap is so movable that it can be used for a plastic of the ear. By this method we have two advantages (1) the flap is already accommodated to its new pedicle nourishment, and (2) the flap is completely covered with skin at the back, and the place from where it was taken also.

3. *Enlargement of the Mucous Membrane of the Mouth.*—This is often desirable after jaw injuries or in patients, who, after extensive inflammation have suffered scarring, with contraction of the mucous membrane. In these cases a vertical incision is made in the skin of the middle of the lip and prepared from there to the left and right, under the skin for two or three inches and a width, of ¾ inch, two hollows being thus formed which are filled with modelling composition covered with Thiersch in the manner above described. Two weeks later a cut is made inside the mouth, over the thinnest covering of the composition, and after removing the inlay, the cavity is laid quite open with the scissors. An impression of the jaw may be immediately taken, which was impossible before the operation, owing to the adhesions, and an artificial denture can be made and inserted to replace any lost teeth. The lip, formerly quite immovable, at once regains its use.

4. *Enlargement of the mouth cavity* can be carried out in the same way as with the eye and ear cases. After removal of the scar, a cross cut is made, and a space formed which is filled with a mold of composition, covered with Thiersch, and sewn together. Here, as in all such intra-oral plastic cases, a layer of iodine gauze is put between the composition and the Thiersch. A frequently occurring indication for this procedure lies in large bone defects of the center of the lower jaw, the so-called "bird-face." By cutting the outer skin, all scars are completely removed and then, by internal enlargement through the outer cut, a cavity is formed by pushing the jaw pieces apart until the normal jaw line is obtained. This is not always possible without cutting the mucous membrane vertically. When the elasticity of the membrane allows this opening is sewn together horizontally, otherwise it is closed with a flap, or left open, as an uncovered epidermic inlay, even in the mouth, may heal, but this is not quite certain. The cavity is filled with modelling composition covered with Thiersch, which is removed ten days later by cutting on it inside the mouth. The

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opening is enlarged with scissors, as described above and the dentist immediately takes an impression and prepares a temporary prosthesis without teeth. This is exchanged later for a permanent prosthesis with teeth. This prosthesis has to perform the following uses: to fill up the cavity, giving normal anatomical lines, and to support and connect the jaw into a continuous piece. The appearance of the patient is thus rendered quite normal, and a bone graft can later be inserted, the tissues through their stretching and accommodation to normal position offering better conditions for this than before.

5. *Defects of the Palate.*—Even though these defects be of very large dimensions, this procedure is of great value. The mode of procedure is similar to that of Lane, but is an improvement in that raw surfaces are immediately covered with epithelium. According to the size of the defect, at a greater or less distance from it, a curved incision is made on the alveolar process, through gum and periosteum, and a sufficiently large flap raised. Between this and the bone, the impression material covered with Thiersch on both sides is placed, and the edge of the flap sutured back in place. At a second operation, after one or two weeks, the line of suture is opened, enlarged above and below, the mold removed and the flap turned over and the edge after freshening, inserted under the edge of the mucous membrane on the other side of the defect.

In carrying out the epidermic inlay method of grafting, the following points are to be especially borne in mind:

1. Care must be taken in the formation of the cavity, if this is to be opened elsewhere than the line of suture, as for example, in the mouth, that at the point of secondary opening the covering be as thin as possible. Also the bottom of the cavity must be as flat as possible so that the Thiersch may be inserted without creases. The space should in a measure be funnel-shaped, *i. e.*, without undercuts, so that the impressions may be removed and inserted easily. Although a perforation of the wall must be carefully avoided, the Thiersch can bear much exposure to infection.

2. The skin should be prepared only with tincture of iodine, and other moisture carefully avoided. The skin is to be freed of all dead cells by thorough shaving without soap or moisture, and then the Thiersch cut of an even thinness, in one piece of the required size. It is important to cut the Thiersch immediately before inserting in the cavity, avoiding the use of salt solution, and to insert it before the raw surface becomes dry.

3. The mold should be very exact, and of such a size that the edges of the wound can be brought together, though it is of no essential disadvantage if the suture line gaps a little.

4. The sutures must be strong, and deeply taken so that they do not tear out too soon.

Application of Thiersch as a substitute for mucous membrane has an advantage over the whole skin with its glands, etc., in that it accommodates itself more easily to the mucous membrane conditions. The whole skin under such conditions goes through a long stage of inflammation or eczema, while the Thiersch only shows a strong scaling in the mouth at the beginning.

4. Esser, J. F. S. Plastic Work on the Face. *Surgery, Gynecology and Obstetrics*, 1917, xxiv, 437.

The writer prefers to cover defects of the face with tissue from the immediate neighborhood. Avoids, if possible, the application of pedicle flaps from a distance. The first consideration in plastics of the face is the good appearance of the patient. The muscles of expression must be considered, fat tissue must be provided. The skin to be used must be chosen so that it closely resembles the skin of the area to be covered, in color, shade, elasticity, thickness, direction of its fibers, hair, number and size of pores. The most essential principle is simplicity. The use of skin from nearby surfaces is preferred to skin from distant parts. In almost every instance, even in very large defects, this principle can be carried out. The one point necessary is that the parts be made sufficiently movable, either by cutting on one side—half pedicled or when necessary, with entire pedicles. The general opinion that this causes deformities is false.

When the wound edges have fallen in, leaving a depression, the fat and muscle tissue are undercut and brought together by layers of sutures in a ridge exactly beneath the suture line. Strict asepsis must be observed. Before operation the skin

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is shaved using no moisture, and then painted with tincture of iodine. The skin is kept as dry as possible during the operation.

Local or regional anesthesia used. As small a quantity of the anesthetic solution as possible is used, and injected into rather than around the edges of the wound.

The greatest care is used in the total excision of all superficial and deep scars.

No tension in the skin is allowed, all tension being borne by hidden deep sutures.

After the operation calomel powder is dusted on and around the wound, which is left uncovered. The sutures enter not toward the wound edge but perpendicularly or receding from the edge. The knots are placed to one side of the incision.

The wounds must be kept absolutely immobilized. The patients are forbidden to speak or move the lips. Liquid diet is given through a rubber tube.

Classification of simple face plastics.

1. Simple lineal seam:
   - (*a*) After scar excision
   - (*b*) After scar and skin excision.
2. Complicated lineal seam:
   - (*a*) With underlay from direct neighborhood
   - (*b*) With underlay of free transplanted fat.
   - (*c*) With alteration of skeleton.
3. Seam with displacement of one wound flap after mobilization by simple cut:
   - (*a*) With very large basis.
   - (*b*) With narrow pedicle.
   - (*c*) With island flap.
4. Seam after mobilization of both flaps.

5. GRANT, W. W. Cancer of the Lip. *Jour. A. M. A.*, 1916, lxvi, 1368.

Plastic operation after resection of cancer of lip. (Applicable to defects following injuries.)

The defect is made to assume rectangular shape.

From lower angles of rectangle, incisions are made obliquely downward and outward, dividing all tissues, including mucous membrane and crossing mandible at a point equidistant between the angle and the symphysis and carried back beneath the mandible as far as necessary. The cheeks are then separated from the mandible at least as far back as the masseter muscles if necessary. The facial arteries are cut. The flaps are then brought forward and united to each other with silkworm gut in the middle line. If there is much tension, tie a mattress suture over gauze at the line of union of flaps. Stitches of silkworm gut are placed in the lateral incisions and should include the entire thickness of the cheek. It is sometimes necessary to enlarge the mouth by an incision backward and slightly downward from each angle of the mouth down to the buccal mucous membrane, and the latter separated from the overlying tissues above and below the incision to the extent of ½-inch. The lip above and below is now beveled from the inner border of the incision to facilitate the easy covering of the lips by mucous membrane which is now divided with scissors nearly to the angle of the skin incision and united to the skin with a running suture of chromic gut. A small rubber drain is inserted from the posterior angle of each lateral incision beneath the mandible and a "T" drain through a submental incision, (when necessary), into the mouth, under the tip of the tongue. The "T" end rests behind the incisor teeth, and the outer end is fixed by a safety pin. This drain limits soiling of the wound with saliva.

The same principle of incision applies to defects of the upper lip.

The fact that the deformity may be distinctly to one side of the mouth does not in the least alter the principle of the incisions, the flap from the opposite side will simply be longer.

The covering of the flaps and the vermilion border with mucous membrane is essential to prevent disfiguring constriction.

After-treatment.—The first dressing is changed in 24 to 36 hours, and is repeated thus for a week. The mouth is irrigated through the "T" tube as well as through the mouth, with warm boric and normal salt.

Patient is nourished through feeding tube until the stitches are removed (a week or ten days).

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6. Horsley, J. S. Plastic Operations for Acquired Deformities of the Face. *Jour. A. M. A.*, 1916, lxvi, 411-414.

Dressing After Operation: Dust with boric acid powder and leave open. If there is much oozing, a compress of dry gauze is applied for a few hours. When any of the cavities of the face are involved in the wound, hexamethylenamine is given before and after operation.

For large defects of the cheek, transplantation of the anterior temporal artery with frontal flap seems desirable. Artery is dissected with considerable tissue around it and transplanted to a new bed by an incision that merely goes through the skin and not deep enough to sever branches of the facial nerve. The skin is undermined on each side so as to cover the artery without tension. The flap is stabbed in several places to facilitate oozing of blood and prevent congestion. In transplanting pedicled flaps, leave the pedicle about two weeks.

7. Imbert, L., and Lheureux, C. Uranoplasty for an Oblique Loss of Palatine Substance. *Marseille Med.*, 1916, liii, 81-85.

The flaps, instead of being in the classical antero-posterior direction were transverse. Transverse incisions were made about 1 cm. on each side of the break which was oblique. Flaps were raised from the bony vault, and the edges freshened and approximated. Silk sutures were used. A vulcanite plate was attached to the teeth to immobilize the parts and protect them from trauma, food, etc.

8. Morestin, H. Palatine Defect Covered at the Expense of the Mucous Membrane of the Cheek. *Bull. et mem. Soc. de Chir. de Paris*, 1916, xlii, 1711.

In this case there was a large loss of substance of the palatine vault, putting the mouth in communication with the nasal fossae. It was situated on the right side at the union of the hard with the soft palate. It extended from the median line, which it crossed slightly to the left, as far as the alveolar border which it reached behind the second upper molar, the third molar having disappeared. It occupied more than 2 cm. in its transverse diameter, about 15 mm. in its antero-posterior diameter. It was ovoid with the long axis oblique from in front backward, and from left to right. From its right edge extended a very strong cicatricial band of a pearly white end which descended toward the cheek and ended on the external surface of the mandible at the level of the last molar. The orifice of exit of the projectile left a depressed and adherent scar at the angle of the mandible.

Operation Under Local Anesthesia by Cocain Infiltration.—The edges of the opening were freshened, followed by resection of the buccal part of the ring to allow of entrance of the flap. The fibro-mucous tissue was liberated with the elevator to the extent of about 2 cm. in front of the perforation and on the left side. Behind, the mucosa of the soft palate was liberated also to a sufficient extent. The fibrous palato-buccal band was then excised. In the mucous membrane of the cheek a large flap was cut whose pedicle corresponded to the gingivo-buccal groove at the level of the second upper molar, and whose point was found immediately behind the labial commissure. The upper border of this flap grazed the opening of Steno's duct. The flap was dissected free with scissors. When detached in all its extent, it was turned inwards, placed in the area of lost substance and fixed with horsehair sutures throughout its circumference.

The flap had good vitality, preserved a good appearance and was under no tension. The wound from which the flap was borrowed could be reunited almost completely.

The results of the operation were perfect. The flap united by primary intention. The sutures were removed from the sixth to the eighth day. The patient has overcome difficulty of alimentation and expresses himself in a natural voice. Care is taken that he carries out exercises for making supple the muscles of mastication and for spreading the jaws. He already opens the mouth very widely and the contriction of the jaws will in all probability be almost entirely overcome.

9. Pietri, P. Autoplasty of the Face According to the Method of Professor Moure. *Presse Medicale*, July, 1917, p. 388.

The originality of the method of Moure consists in the utilization of the subjacent fatty pannicule, exposed, doubled, turned back according to the Indian

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method and employed as a padding just as in the case of the free fat graft. The procedure is especially useful in the repair of wounds situated in the temporal, buccal and submaxillary regions. The fat employed in the cheek region is taken from the fatty pad of Bichat, occupying the space between the masseter and the buccinator.

It is necessary to disinfect the wounds, to extract splinters, and wait until healing is complete.

In the case of cicatrised wounds, the patient is submitted to treatment with hot air and massage in order to try to give to the traumatised tissues the suppleness that they have lost. Massage and hot air augment circulatory activity and nutrition of the tissues. In many cases this treatment suffices without surgery.

Local anesthesia always gives excellent results and it is unnecessary to resort to general anesthesia in employing the method.

10. Von Hackbr. The Plastics of Penetrating Cheek Defects Due to Gunshot Injuries. *Beitr. z klin. Chir.*, 1916, xcviii, 289.

First Stage: Flap cut from cheek down neck commencing close to defect but in such a way that a strip of skin is left between defect and flap. This strip is termed the bridge. The flap, which hangs from the cheek, is turned over, passed *under* the bridge, and part of it covered over the defect. This is sutured to the edges of the defect and the former outer skin surface of the flap thus forms the interior lining of the mouth at the defect. The edges of the flap site are approximated.

Second Stage: This takes place when the flap has healed in the defect. It consists in severing the lower edge of the bridge and with this, and the unused portion of the turned over skin flap, patching over the external surface of the defect and approximating the edges.

SALIVARY GLANDS AND DUCTS

1. Blair, V. P. Septic Parotitis. *Medicine and Surgery*, 1917, i, 84.

In discussing the similarity of biliary duct disease and inflammation of the salivary ducts, the point is brought out that probably stone irritation and obstruction is the cause of the intermittent enlargements of the gland, and that simple subactute or chronic inflammation without stone is not very common. Stones in the parotid ducts are much more difficult to demonstrate than those in the submaxillary ducts. While there are two theories of acute infection of the glands, especially in the parotid, (1) metastatic, and (2) due to ascending infection of the excretory ducts—the author contends that neither of these has been demonstrated beyond dispute.

The treatment of acute septic parotitis is described in detail, special emphasis being placed on early radical operative procedure. Special stress is placed on extensive incision through the capsule, allowing the gland to expand and exploration of the gland for pus, especially the prolongation that runs along the duct.

2. Crouse, H. New Technique for Operations on Steno's Duct. *Surgery, Gynecology and Obstetrics*, 1915, xx, 593.

Technique is as follows: Incision made over cheek 2 cm. below and parallel to zygomatic process, 2 cm. in front of ear; incision about 3 cm, in length, simply cutting through skin and adipose tissue of cheek; fascia of parotid incised and exposed for about 1 cm. parallel to skin incision; lip is grasped and cheek turned out; a pointed strip of buccal mucous membrane ¼-inch wide and ⅛-inch deep is marked off commencing slightly within the vermilion border line of upper lip stripping the same back slightly posterior to or even with the cusp of second molar tooth, leaving posterior end of strip thicker than anterior end and unseparated. Mucous strip is clipped with curved scissors, care being taken to cut deep enough so that its vitality is not impaired. This strip is tagged with an artery forceps. Next, a Doyen or similar forceps is passed through the external cheek wound over the surface of the masseter to its anterior border; buccinator is punctured and mouth entered just in front of posterior end of area denuded by buccal mucous membrane strip forceps are widely stretched; mucous strip caught, drawn into cheek wound and sutured with No. 0 ten day chromic catgut, similar to Lembert's intestinal suture, making a double tie leaving the ends long, in order to secure the loop of No. 5 ten day chromic gut, the ends of the latter remaining in the mouth; skin wound is sutured subcuticularly, the mucous membrane strip being whipped together with small chromic gut.

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3. Lilienthal, H. A Method of Incising Parotid Abscess without Injury to the Facial Nerve Distribution. *Amer. Jour. Surg.*, 1917, xxxi, 101.

Instead of the long painful wait for something to happen, when suppuration has been recognized in the parotid gland, the author offers prompt relief by an incision, which he claims permits of free drainage and the avoidance of unsightly scars as well as injury to important branches of the facial nerve.

A description of his method is as follows:

A vertical skin-deep incision is made in front of the auricle and just as close to it as possible; this is extended to the hollow behind the angle of the jaw, and thence in a gentle curve forward as far as the projection of the anterior border of the masseter muscle; the flap of skin thus formed is reflected forward, revealing the greater part of the parotid gland and its overlying fat and fascia. The incisions, as many as are necessary for drainage, may now be made through the parotid fascia into the gland itself, the line radiating in a general way along the course of the pes anserinus. No incision, however, should cross the line of Stenson's duct for fear of salivary fistula. Deeper collections of pus may be evacuated through this same cutaneous incision by puncturing through the fascia, behind the ramus of the jaw and then enlarging the opening with the director and dressing forceps.

The opening into the parotid may be packed or otherwise drained, the skin flap not being replaced until healing is well advanced, when it may be held in position with adhesive strips.

4. Morestin, H. Treatment of Salivary Fistulae Consecutive to War Wounds. *Bull. et mem. Soc. de Chir. de Paris*, 1917, xliii, 835.

Since the beginning of 1915, Morestin has treated 62 salivary fistulae, 30 being glandular, and 32 fistulae of Stenson's duct. Of the glandular fistulae 6 were cured after treatment by the thermocautery; 26 were extirpated; 24 were cured without the least accident.

In the fistulae of Stenson's duct, the author thinks that the best treatment in many cases is obliteration of the duct, which naturally comprises physiological suppression of the corresponding parotid gland. Although this is a very radical procedure, he is led to it by several considerations, as he has found in the patients treated, that reimplantation of the duct after elimination of the fistulized portion was impossible, and internal drainage pure and simple rarely utilizable. Extirpation of the fistulized tract is therefore imposed as an absolute necessity. His procedure, then, is to extirpate Stenson's duct, ligature its stump at its origin, and obtain reunion without drainage. Obliteration of the canal brings about rapid physiological death of the parotid gland, but Morestin says that this has no perceptible effect on the organism. In 16 cases, an incomplete eradication of the canal was done with establishment of drainage toward the buccal vestibule. All recovered, and as far as Morestin knows, the fistulae has been cured, but he cannot say with certainty that an artificial canal was not established in any of these cases.

In 13 cases the complete radical operation was done with excellent results, and Morestin now employs the method exclusively.

The general conclusion drawn is that when such a fistula does not spontaneously close, the most general and most essential indication from the point of view of operative technique is to extirpate with the greatest care, at the same time as the fistulous tract, the whole of the fibrous tissue through which it runs, so that only supple and healthy tissues are left. In glandular fistula, suture and hermetic sealing of the glandular walls suffice to occlude the salivary orifice.

ANESTHESIA

1. Thoma, K. H. Extraoral Conductive Anesthesia for Oral Surgical Operations *Am. Jour. Surg.*, 1917, xxxi, 14.

Preanesthetic medication always indicated.

Main divisions of fifth nerve reached at foramina of exit by usual routes.

Mandibular Anesthesia at Mandibular Foramen.—Extraoral pterygomandibular method.

Indicated whenever the intraoral method cannot be used, as is often the case in fractures of the mandible and trismus of the muscles of mastication.

Landmarks.—Line drawn from tragus of ear to a point marked by anterior

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margin of masseter muscle and lower border of mandible. The point where the ramus is divided into two halves, marks the projection of the mandibular foramen on the skin. The place to insert the needle is the inner side of the lower border of the mandible, 2 cm. anterior to the angle of the ramus.

Position of Left Hand for Injection of Right Side.—Place index finger behind, and parallel, with posterior border of ramus, the thumb in same direction, its tip touching lower border of ramus.

Position of Right Hand for Injection on Left Side.—Arm passed around patient's head, thumb placed behind posterior border of ramus and index finger bent around angle of ramus. Head bent toward opposite side. Dismounted needle is now inserted at point described. Advance in parallel direction to posterior border of ramus, marked on left side by the thumb and on the right side by the index finger.

After the needle has been inserted about 4 cm., we are in the pterygomandibular space, and as the direction of the needle is parallel with the nerve it does not matter if the needle is inserted a little too far. Inject 2 c.c. Anesthesia takes effect in fifteen minutes.

Failures.—The advance of the needle may find bony resistance in the depth of 3 cm. This comes from false direction of the needle point, striking a well marked internal oblique line. The needle may strike bone at once, which may indicate a well-marked protuberance for the attachment of the pterygoid muscle. These mistakes are remedied by changing the direction of the needle.

MISCELLANEOUS

1. Bowlby, Sir A. The Development of British Surgery at the Front. *Brit. Med. Jour.*, June 2, 1917, p. 705.

The following table was compiled by Captain Hey, Surgical Specialist at one of the forward Casualty Clearing Stations, and includes a period of heavy fighting during a recent battle. The length of time covered by the figures is not specified.

Table of Operations Performed at a Casualty Clearing Station

A. Ligature of arteries		277
B. Treatment of fractures:		
Skull	189	
Vertebrae	18	
Humerus	298	
Forearm	133	
Femur	299	
Leg	309	
Jaws	38	
Various	119	
Total		1,403
C. For treatment of joints		247
D. Amputations		431
E. Wounds of abdomen, drainage of pleura, etc		280
F. Excision and cleansing of wounds:		
Head and neck	95	
Trunk	309	
Upper limb	249	
Lower limb	765	
Multiple	398	
Total		1,816
The total number of operations performed for gunshot wounds amounts to		4,454
Total number of wounded admitted		20,589

Special Hospitals for Head Cases.—It has been found advisable to retain a considerable number of these cases near the front either in stationary or general hospitals,

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or else in a casualty clearing station of the reserve. They do not need the immediate operations required for abdominal cases, and are consequently provided for farther back.

It is now the custom of all casualty clearing stations to dress their patients in large reception huts or tents as soon as they arrive, and to distribute them from this place as quickly as possible: (1) for immediate evacuation, (2) for retention, (3) for operation. In the first class are included chiefly the slightly wounded. In the second class are patients suffering from shock, from the effects of bleeding, from wounds of the lung, exposure to cold, etc. In the third class are all serious wounds of the soft tissues which require thorough dressing and especially lacerated wounds due to shells and bombs; most fractures; many injuries of vessels; all perforating abdominal wounds, etc.

The proportion of cases requiring operations to the whole number of wounded will depend on many conditions—for example, the larger the proportion of shell wounds to bullet wounds, the larger the number requiring operation and if a train is waiting to go to the base, men may be sent by it who would require operation if they had to be kept for 36 hours.

2. D. (W. H.). Report of the Dusseldorf Hospital for Injuries of the Jaws. *Brit. Dent. Jour.*, Lond., 1917, xxxviii, 98-100.

Report compiled by Professor Bruhn, comprising work from August 15, 1914 to August 15, 1916. At latter date, hospital consisted of 550 beds, besides accommodation for medical and nursing staffs—several buildings. In each 2 operating rooms, one for septic and one for aseptic cases. Also dental operating rooms, with necessary chairs, etc., and mechanical laboratories, kitchens, etc. Each building has a dental surgeon, 3 to 5 assistant dental surgeons, 2 to 4 mechanics, a clerk, masseur, matron, nurses, etc. Probably 5 dental surgeons, 18 assistant dental surgeons, 12 to 16 mechanics.

Two surgeons are attached and one physician and specialists for nerve diseases, eye, nose and throat.

During the period under review, 1,748 soldiers were admitted, 19 of which were prisoners and 62 officers. Of these, 1,081 were discharged, 210 fit for service, 481 fit for garrison duty; but of these 173 would be fit for field service when elsewhere the necessary dentures were provided; 12 were fit for work; 7 were unfit, 2 on account of jaw injuries, 5 on account of other injuries or diseases; 360 were sent to other hospitals; 9 patients died; 652 remained in the hospital. Ratio of injuries of maxilla, of mandible, and of both together, is roughly as 1:5:1. By far largest number due to rifle bullets, those due to shell fragments next, and then those due to shrapnel. Of the fractures, 167 were simple, 694 complicated and in 369 there was loss of substance. Of these patients 306 had gunshot injuries elsewhere. List of operations includes 907 plastics and 205 bone grafts on mandible.

Feeding and Diet.—Diet divided into 3 groups, fluid, minced and ordinary. Work provided for convalescents.

3. Fisher, A. R. Chloramine in the Treatment of Wounds of the Mouth and Jaws. *Brit. Med. Jour.*, January 15, 1916, p. 87.

A 2 per cent aqueous solution was used.

The usual surgical procedures were carried out under an anesthetic, such as opening up of external wounds, removal of loose bone, teeth, foreign bodies and jagged portions of tissue, arrest of hemorrhage and suturing of the severed tissues. Small drainage tubes were inserted through the wounds and the mouth to allow the access of the fluid to all the damaged surfaces. The distal ends of the tubes were allowed to project outside the bandage so that the reagent could be introduced frequently without disturbing the dressing. Irrigation was carried out every hour during the day and as often as possible during the night, the patient sitting up in bed. Three or four syringefuls (2 oz. capacity) were injected through each tube, the fluid returning through the mouth into a receptacle. The patient was fed through a tube, irrigation with the chloramine being carried out immediately before and after.

Under this treatment, the wounds healed rapidly and the fetid suppuration characteristic of extensive mouth wounds was conspicuously absent.

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4. KAZANJIAN, V. H., and BURROWS, H. The Treatment of Hemorrhage Caused by Gunshot Wounds of the Face and Jaws. *Brit. Jour. Surg.*, July, 1917, p. 126.

The paper is compiled from records of 400 cases of gunshot wounds of the face with fracture of the jaws.

Frequency and Time of Hemorrhage.—Of a total of 34 mild and serious hemorrhages occurring among the 400 cases (8.5 per cent), 16 required operative measures for controlling the bleeding under a general anesthetic, while the remaining 17 were successfully treated by packing, clamping, or by the use of a local anesthetic for ligation of the bleeding point. One case died suddenly from very profuse hemorrhage.

The majority of secondary hemorrhages took place between the fourth and twelfth days after injury, three between the thirteen and nineteenth days, and only one after this period, viz., on the forty-fifth day. Most of the secondary hemorrhages appeared during the night or early afternoon, *i. e.*, during the hours of sleep.

Sources of Hemorrhage.—It is not always possible to determine the artery which is responsible. Injuries to the superior maxilla and other bones of the upper half of the face are often accompanied by nasal bleeding from the deeper structures, which arises probably from the branches of the internal maxillary artery. Among 91 cases of fracture of the upper jaw, there were 4 hemorrhages; in 3 of these, hemorrhage was easily controlled by packing, while in the remaining one it was persistent and recurrent. Hemorrhage from the main trunk of the internal maxillary artery is rarely or never met with.

In 7 cases of extensive laceration of the face, bleeding from the mouth has occurred. In all the hemorrhage was superficial, with the source of the bleeding exposed, and it was stopped by packing, by the application of clamps or by immediate ligation of the vessel under a local anesthetic.

In those cases where the wounds are below or behind the angle of the lower jaw and involve the pharyngeal cavity and the neck, it is difficult to decide by internal examination which side is responsible for the bleeding. Two out of three such cases of hemorrhage from the pharynx were fatal.

Bleeding which occurs as the result of an extensive wound of the molar and bicuspid region of the lower jaw and accompanying injury of the floor of the mouth, usually arises from the lingual artery or its branches. Such cases have been most common—17 out of 34. Twelve of those required operative means of control under a general anesthetic.

Certain cases which presage hemorrhage from the lingual artery have recognizable characteristics. The wounds of entrance and exit are usually small, and situated in the vicinity of the posterior half of the lower jaw. The tongue is perforated, often dark purple in color, and swollen to twice or three times its normal size, so that the mouth is held open and the tongue protrudes beyond the lips. The jaw is fractured bilaterally, and the anterior segment shows a pronounced downward displacement.

On the other hand, large wounds anterior to the bicuspid region are unlikely to presage serious hemorrhage, since the area affected is supplied only by smaller vessels.

Extensive injuries, with destruction of the hard or soft tissues, but which are open, are less prone to bleed, because the free drainage forestalls the spread of sepsis.

TREATMENT

1. *Preventive Treatment.*—Thorough cleansing of the wound and mouth and temporary support of the fractured jaw, are measures that will very greatly reduce the tendency to secondary hemorrhage from sepsis. Temporary support may be brought about by the Barton bandage, Angle's bands, or wiring of the teeth. Dental splints should be used as early as the patient's condition will permit.

2. *Immediate Treatment.*—The seepage of arterial blood, which in most cases precedes a serious hemorrhage, is almost the only anticipatory indication of value. The exact area from which bleeding might be expected should be considered beforehand.

In the event of an emergency, the tray used in the ward for dressings may be depleted at the moment when it is most wanted, and therefore a separate one should always be kept in readiness with swabs, ribbon gauze, artery clamps, sinus forceps, dental mouth mirrors, a head mirror, adrenalin chloride, hydrogen peroxide, etc.

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As soon as the hemorrhage appears, the attending nurse should send for the medical officer, and while awaiting his arrival, should syringe the patient's mouth with peroxide and attempt to control the bleeding with digital pressure. The patient should be kept sitting in bed against a back rest, to facilitate the work, to reduce the blood pressure in the head, and to prevent the flow of irrigating solutions and blood into the throat. The use of hydrogen peroxide gives a clean field of operation in the shortest time and acts to a slight degree as a hemostatic. Following this, the area is swabbed rapidly and that part from which blood issues is packed tightly with gauze soaked in adrenalin chloride.

As an adjunct to packing, a specially devised clamp will be found useful. This consists of a heavy piece of wire from 8 to 10 inches long, bent to a "U" shape with a finger or pad of dental modelling composition or vulcanite rubber on each end. The clamp is adapted by bending it so that one end passes over the packing, the other presses externally at a corresponding point under the chin between the hyoid bone and the lingual aspect of the mandible. Ligatures or elastic bands about the arms of the clamp will give the desired amount of pressure. A clamp of similar pattern, but of reduced dimensions, serves for the arrest of hemorrhage from the facial artery, exactly as one would pinch it with the thumb on the cheek and the forefinger inside the mouth. Even though the act of packing may not be the final means of stopping the hemorrhage, nevertheless it must be carried out to control it for the moment and to minimize the chances of recurrence before ligation is effected.

3. *Operative Treatment.*—In cases where packing the wound is not sufficient to control the hemorrhage, three courses are open for consideration, viz.:

(1) Ligation of the responsible vessel at the bleeding point; (2) ligation of the vessel at some spot proximal to the bleeding point; (3) ligation of the external carotid artery.

Ligation of the common carotid artery is not included as one of the available measures because of its uncertainty in arresting the hemorrhage and on account of serious interference with the cerebral circulation.

(1) *Ligation of the Bleeding Point.*—The first proposal is to find and secure the bleeding point, which is available in certain cases, most of which are of lesser severity. The following are the four varieties of cases in which an endeavor to secure the bleeding point is the correct practice.

(*a*) *Those in which the bleeding is external.*—Here the blood is not effused into the mouth, and the injured vessel may be sought for without any invasion of the buccal cavity. Injury of the facial artery, or one of its branches, submental or coronary, provided most of the examples.

(*b*) *Intrabuccal hemorrhage of small volume.*—In these cases the bleeding is not sufficiently profuse to obscure the field of operation, or cause much harm to the patient if allowed to continue during a brief local investigation. Such a hemorrhage may come from an artery of the frenum of the tongue, one of the palatine arteries, or some other small branch of the lingual, faciae, or internal maxillary.

(*c*) *Copious hemorrhage from the free portion of the tongue.*—This arises from the ranine artery, and the bleeding is often alarming, owing to the abundant flow. Temporary arrest, however, may be effected readily by placing a pad of gauze under the tongue, and pressing the tongue on the pad by means of a finger held firmly on the dorsum. The artery is easily accessible from the mouth for purposes of ligation.

(*d*) Profuse intrabuccal hemorrhage from the floor of the mouth when the face is opened sufficiently to allow a good view of the deep tissues at the base of the tongue. These cases are not common. The bleeding point can be looked for directly, because of the open nature of the wound. Another favorable feature is that the effused blood flows freely from the buccal cavity owing to the wide extent of the injury, and so does not cause the special difficulties that arise from the presence of a continual well of blood in the mouth.

One occasional source of difficulty in all these emergencies lies in the cessation of the hemorrhage during operation; a contingency that is to be expected if local anesthesia be used, but which sometimes takes place also with general anesthesia. Even rubbing the wound with gauze or other local stimulation may fail to reproduce the bleeding, with the result that the offending vessel cannot be located. Accurate observation of the wound while bleeding is still in progress may do something to mitigate this annoyance, but even careful preliminary investigation will not enable us always to avoid failure from this obstacle. The only remedy left is to examine

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the wound for any adherent clot and, by tracing it gently and minutely, endeavor to find the vessel from which it has originated.

(2) *Ligation of the Bleeding Artery at a Point Proximal to the Injury.*—In the majority of cases of profuse intrabuccal hemorrhage from the floor of the mouth, ligation of the bleeding point is impracticable. The next plan is to secure the injured artery at some point proximal to the seat of trauma. The chief difficulty here is to recognize which artery is responsible. We have to consider eight possible sources, four on each side—lingual, facial, inferior dental, and lastly the external carotoid itself, with its tonsillar, pharyngeal, and other branches. In some cases, *e. g.*, in a through and through wound about the angles of the lower jaw, with small entrance and exit openings, we cannot definitely exclude any of these. We are often even unable to determine from which side the hemorrhage comes. Attempts to settle this question by alternate digital compression of the carotids in the neck, generally fail. Anatomical considerations founded upon the situation of the wounds and the track of the main projectile are often vitiated by the fact that the bullet or a fragment of shell converts pieces of bone and teeth into secondary projectiles, which scatter and so cause damage to structures lying away from the main path. Simultaneous damage to two or more arteries may be another confusing complication. Broadly speaking (*a*) bleeding from the floor of the mouth comes from one or both lingual arteries or their branches; (*b*) bleeding from between the fragments of a broken lower jaw arises from the inferior dental; (*c*) bleeding from the cheek or lip has its origin in a branch of the facial; (*d*) bleeding from the pharyngeal and tonsillar regions will call for ligation of the external carotid artery. The fracture and comminution of the jaw bone and swelling of the tongue and soft tissues increase the difficulty of approximate localisation of the bleeding point. To avoid these difficulties, the authors adopted the course of ligating the external carotid in all doubtful cases; but before long they reverted to the former practice of ligating, if possible, the individual artery involved. Ligation of the external carotid in these cases of extensive injury to the jaw, face and neck is attended by considerable difficulty and danger. Moreover profuse recurrent hemorrhage from the floor of the mouth nearly always arises from one or both lingual arteries or their branches. The procedure therefore in all copious hemorrhages from this latter area, occurring in connection with gunshot wounds of the lower jaw, is to ligate one or both lingual arteries, provided the anatomical conditions are compatible with a wound of these vessels.

To assume that the lingual is the source and to act on this assumption may seem on first thought to be unsound. However, improved results and lowered mortality more than justify the practice.

TABLE OF COMPARATIVE RESULTS

Artery ligated	*No. of cases*	*Deaths*	*Mortality Per cent*
External carotid	10	5	50
Lingual	6	1	16.6

(3) *Ligation of the External Carotid Artery.*—This is used as a final resort, and does not always dispose of the danger of bleeding, owing to anastomosis and injury of a vessel of the opposite side. Moreover, in the presence of compound fracture of the lower jaw, due to a gunshot injury, ligation of this artery is a dangerous procedure.

OPERATIVE TECNIQUE

1. *Hemorrhage from the Inferior Dental Artery* is usually controlled by packing. Access may also be had if necessary by trephining the ramus of the lower jaw.

2. *Ligation of the Lingual Artery.*—Even in bleeding from the third portion of the lingual artery, with the exception of that from the free ranine artery, the hemorrhage should be controlled by ligation of the lingual artery, in its first or second portions, by a neck incision. In gunshot injuries of this region, special difficulties may be created by the displacement of the broken jaw, and the swelling of the neighboring structures lessens the freedom and ease of exposing the lingual artery. The submaxillary and lymphatic glands are apt to form a solid unyielding mass which lies in the way of a good view of the lingual artery. In some such cases retraction of these structures is unavailing and it will then be found of great assistance to resect them, a maneuver

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that does not materially lengthen the operation, while it greatly facilitates exposure of the lingual artery in the second portion. Better exposure can be had if the assistant presses the hyoid bone up into the wound from the opposite side.

3. *The External Carotid* should be tied high so as to avoid thrombosis and embolism in the common carotid.

In these operations, inhalation broncho-pneumonia is guarded against by the employment of local anesthesia as far as possible, and using morphine sparingly.

General Anesthesia.—The main precautions to be observed are (1) avoidance of inhalation of septic material from the mouth into the respiratory passages. This is guarded against by cleansing the patient's mouth and irrigating with antiseptic solution, immediately prior to administration of the anesthetic, one hour before operation, 1-100 gr. atropine is given hypodermically to lessen the flow of saliva. (2) Provision of a perfectly free airway for the patient, so that there will be no violent efforts to breathe, and no unnecessary engorgement of the veins of the neck to increase the length and difficulty of the operation. To these ends the authors employ pharyngeal anesthesia through intranasal tubes, the back part of the mouth being packed with gauze. Of the 34 cases of secondary hemorrhage, 7 died.

5. Lewisohn. Method of Sodium Citrate Blood Transfusion. *J. A. M. A.*, March 17, 1917, p. 826.

Lewisohn's experiments have shown that 0.2 per cent of sodium citrate in blood is sufficient to prevent coagulation outside the body for 2 or 3 days. Five grams of sodium citrate represents the largest amount that can be safely introduced into an adult. 1,000 c.c. of blood containing 0.2 per cent citrate only represents 2 grams of sodium citrate. The technique employed by Lewisohn is most simple.

1. *Obtaining the Blood from the Donor.*—A tourniquet is applied to the donor's arm and one of the veins at the bend of the elbow punctured. A large canula is used, so the blood will flow rapidly. The blood is allowed to fall into a graduated glass jar which contains 2 per cent sodium citrate solution, in quantity necessary to make a 0.2 per cent solution in the amount of blood to be given. For example, if we want to give 450 c.c. of blood, we add this to 50 c.c. of the 2 per cent citrate solution. The blood is well stirred as it falls into the jar. Care must be taken never to have less than 0.2 per cent of sodium citrate or the blood will coagulate. A slight surplus of citrate solution will prevent this and can be added with perfect safety.

2. *Infusion of Blood into the Recipient.*—The citrated blood is either administered through a funnel or transferred to a glass infusion jar. The patient's vein usually has to be exposed through a small incision. The canula is inserted and attached to a funnel or infusion jar which contains 20 or 30 c.c. of physiologic saline solution. The citrated blood is then poured into this receptacle and allowed to flow into the vein by gravitation.

Before resorting to transfusion in any case, whenever possible, a Wassermann test must be made in the donor, and the blood of the donor and recipient must be tested for agglutination and haemolysis. Neglect of these precautions may bring disastrous results.

The simplicity of Lewisohn's technique renders it available to all, and makes it superior to all other methods of transfusion either direct or indirect.

6. Luc. Tracheotomy. *Presse Medicale*, 1916.

Instruments required: Bistoury, grooved director, scissors, one-half dozen hemostats, pair of broad retractors, narrower retractor to apply to the inferior angle of the wound, tracheotomy tube. Local anesthesia.

(*a*) Place a hard pillow not under the neck, but under the shoulders of the patient so as to make prominent the anterior cervical region.

(*b*) Have a trustworthy assistant attend to the head. The position of the head in extension, ideal for the making prominent of the region and for the discovery of the trachea, is unhappily difficult to keep for a patient more or less dyspneic. It is indispensable then that every time the patient shows a pressing need for air, the assistant charged with holding the head shall lift it up for a few instants.

(*c*) Carefully mark the cartilages of the larynx. Whilst for the performance of the operation proper, it will be indicated to place oneself to the right of the patient, we recommend a situation to the left for execution of the maneuvers of the local anesthesia, the syringe being much easier to manage from this side, above all if

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care is taken to strongly lift up the skin pinched between the thumb and index finger of the left hand. One per cent novocain and adrenalin are used. The injections are made first intradermically on the line of the projected incision, then under the skin and in contact with the trachea. After this a massage is executed for all the infiltrated region to diffuse the liquid. Wait five minutes. Incision is made in the median line—not too low, *i. e.*, commence at superior border of cricoid and downward about 5 cm. Have assistant at the same time retract equally with the two hands. Be sure to keep in the median line. After denuding the cricoid, extend the denudation with the grooved director downward to the upper part of the trachea. When the first ring of the trachea becomes perceptible to the touch, apply to the inferior angle of the wound the narrow retractor and make marked traction from above downwards. This lays bare the trachea to a sufficient extent. The bistoury is then plunged through the tracheal wall, the back of the blade applied against the retractor and the rings incised from below upward. It is only after the tube has been introduced and fixed that the retractor is withdrawn. One or two sutures are inserted above the tube.

7. MAKINS, Sir G. H. Development of British Surgery in the Hospitals on the Lines of Communication in France. *Brit. Med. Jour.*, June 16, 1917, p. 789.

Wound treatment.—No difference of opinion exists on two points:

1. The urgency of an efficient primary mechanical cleansing and exposure of the wound cavity.

2. The importance of maintaining the wounded part at rest.

Speaking generally, if the primary mechanical cleansing of the wound has been thoroughly carried out, no further gross intervention should be necessary. Every hour of delay in this first treatment, adds to the subsequent task of dealing with the infection.

In considering the advisability of surgical interference with established infection, clinical evidence as to the predominance of anerobic or aerobic infection forms a most useful guide. In the former case delay may be fatal to life or limb; in the latter an interval of rest often results in a rapid subsidence of local signs and general symptoms, and no further incision may be required.

There is a discussion and comparison of the Bipp and Carrel-Dakin methods of treatment.

Secondary hemorrhage.—The eventual perforation of a vessel wall is up to a certain date, more commonly the result of the separation of a slough of primarily devitalised tissue, rather than the extension of a process of infective ulceration from without.

8. MORISON, R. The Treatment of Infected, Especially War, Wounds. *Brit. Med. Jour.*, October 20, 1917, p. 503.

Summary of technique.—1. Under an anesthetic, usually open ether, cover the wound with gauze wrung out of 1 to 20 carbolic acid, and clean the skin and surrounding area with the same lotion.

2. Open the wound freely and, if possible, sufficiently to permit inspection of its cavity. A guide—a finger is the best if the size of the wound permits of it and, if not, a thick probe—should be introduced to the bottom of the wound and held there and fully exposed. In doing this special regard should be paid to nerve trunks and muscular branches of nerves, since the division of blood vessels, excepting the largest, and of muscles themselves does little harm as compared with that of the disability following nerve damage. Cleanse the cavity with dry sterile gauze mops, Volkman's spoon, etc., and remove all foreign bodies.

3. Mop the surrounding skin and wound cavity with methylated spirit and dry it.

4. Fill up the whole wound with Bipp, rub it well in with dry gauze. Then remove all excess, leaving only a thin covering over the wounded surface. Dress the wound with sterile gauze and cover all with an absorbent pad, which is held in position with sticking plaster and a bandage. This dressing requires no change for days or weeks if the patient is free from pain and constitutional disturbance. Should, however, discharge come through, the stained part must be soaked in spirit and a gauze dressing wrung out of the same applied as a further covering.

Redressing is very simply done. After removal of the old dressings the wound

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is covered with a dossil of wool soaked in spirit, and the sticky, dirty-looking discharge is wiped off the surrounding skin until it is clean.

One drawback to the method is the risk of iodoform or bismuth poisoning due to applying the paste too freely. Another drawback is that as iodoform and bismuth are both opaque to X-rays, there may be difficulty in the discovery of foreign bodies and unsatisfactory pictures of fractures, taken after the paste has been applied.

The author claims that by this method compound fractures of all the bones can now be treated with as great ease, both to the patient and the surgeon, as simple fractures are.

With very few exceptions, fresh wounds can be closed without tube or other drainage than is allowed for, between interrupted sutures not placed too close together.

Preparation, sterilization and keeping of Bipp: Iodoform, 440 grams; bismuth subnitrate, 220 grams; paraffin, 220 grams.

The bismuth and paraffin are sterilized by dry heat at a temperature of 120° C. for half an hour, the bismuth after cooling is mixed with the iodoform in a mortar which has been sterilized by means of boiling water and formalin. The paraffin is added to the mixture at a temperature of 90° C. and thoroughly mixed, then put into specially made collapsible tubes with nozzle ends, holding 40 to 80 grams. The paraffin used should be semi-solid, odorless and tasteless, melting point 45° C., free from acidity and carbonisable organic impurities. The iodoform should be free from moisture, acids and fixed impurities. The bismuth must be pure and free from arsenic.

FACIAL PARALYSIS

1. Morestin, H. Treatment of Facial Paralysis Due to Gunshot Injury, by Muscular Anastomosis. *Bull. et. mem. Soc. Chir. de Paris*, 1916, p. 370.

The patient was wounded by a rifle bullet which entered the upper part of the neck a little below the mastoid process on the right side, crossed the parotid region from behind forward and from without inward, sectioning the trunk of the facial nerve at its exit from the petrous bone, passed inside the ascending ramus of the inferior maxilla, perforated the buccal mucosa in front of the anterior pillar of the fauces, crossed the palatine vault obliquely, then perforated the latter, passed through the palatal process of the left superior maxilla and the corresponding maxillary sinus, with wound of exit in the infraorbital region of the left side.

When seen five months later the patient was seen to have a total paralysis of the right side of the face. The right lingual nerve had also been cut as evidenced by complete anesthesia and abolition of taste sensation of the right half of the tongue in its anterior part. There was, besides, complete anesthesia of the infraorbital distribution of the left side, owing to severing of this nerve at its emergence from the maxillary sinus.

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BOOK REVIEWS

THE MODERN GASOLINE AUTOMOBILE, ITS DESIGN, CONSTRUCTION, OPERATION AND MAINTENANCE, by Victor W. Pagé, M.E. New York City: The Norman W. Henley Publishing Company. Price, $3.

Victor Pagé's treatise on the gas motor car comes to us, in the words of the publishers, revised, enlarged, reset and showing all recent improvements; which certainly appears to be the case.

A so thoroughly recognized standard work, in many editions, would need but mention to demand the attention of all interested in automobiles (who is not!), and an extended review would ordinarily serve no purpose more. But, in this stage of the game, the gas engine has become, to the military medical officer, something more than a means of transport or pleasure; it is an instrument of war and a surgical appliance.

This text-book should therefore be made a factor in the curriculum of our training schools, not only for the instruction of the officers, but of all the men of the sanitary troops; for it is quite desirable, indeed necessary, that all should have an intelligent comprehension of the gasoline automobile, what and why it is, and what it can do, for upon this knowledge will, in no small degree, depend the lives and limbs of our soldiers.

SELF-INSTRUCTION IN ELEMENTARY MILITARY MAP READING AND TOPOGRAPHIC SKETCHING, by Maj. Gustavus M. Blech, M. C. N. G., U. S. Army. Houston, Texas: Standard Printing and Lithographing Company, 1917.

The author first points out the essential differences between the geography map with which every schoolboy is familiar and a map suitable for military purposes, then in proper sequence explains the use of scales, compass, protractor and clinometer, with practical hints as to improvising, and their application to the construction of contours and other details of military map-making. The explanations, together with the illustrations, make the subject so clear that the beginner will be able with a little practice to make a good road sketch and a fair map of a limited terrain. In short, this little book of handy pocket size is indeed a "Self-instructor" which a beginner in the study of military map-making may benefit by. GEORGE ANDREWS.

THE PRINCIPLES AND PRACTICE OF DERMATOLOGY, by William Allen Pusey, A.M., M.D. Third edition; complete revision; illustrated by 54 plates and 466 text illustrations. New York and London: D. Appleton and Company, 1917.

This excellent treatise gives a complete, up-to-date exposition of modern dermatology. To one experienced in dermatology, it is a pleasure to read the text and to study the pictures. It will undoubtedly prove of the greatest assistance to students and general practitioners.

The book is well arranged, the chapters are well adapted, and the headings, sub-headings and paragraphing are most wisely and clearly set off. The ready reading and clear-cut description throughout the text are most gratifying and assuring when one seeks for definite information. Concise statements and well-formed opinions and judgments are everywhere to be found.

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The most outstanding feature throughout is the wealth of most excellent pictures, which accompany the description of practically every disease or condition and are an education in themselves. These pictures are of the black and white type, undoubtedly true to life, and depict, in an exceptional manner, the lesions and characteristic manifestations of the subject. These pictures, practically all of which are actual photographs, give the impression of being well selected and chosen, because they most clearly show those points to be brought to the eye by the clinical picture. Each picture has that distinct value rarely to be found in medical text-books, and such a feature should commend a book on dermatology, in which pictures to illuminate the wordy description are of inestimable assistance and afford the possibility of a more clear-cut conception on the part of the reader of many conditions which are either difficult to recognize, or are so similar in appearance, as to be indistinguishable by one who lacks much clinical experience.

The brevity, yet comprehensiveness, of Part I on anatomy, physiology, pathology, etc., lends to an understanding of that part of this specialty, often a bugbear or commanding little interest on the part of the student.

Twenty-one new conditions, changes of the blood in skin diseases—a feature long neglected—auto-serum therapy, and fulguration compose, in part, the new matter in the book.

The chapter on syphilis presents a most comprehensive exposition of the disease and its treatment, so far as dermatology is concerned, including sections upon the administration of salvarsan and neosalvarsan; in fact, nothing has been neglected to make the information complete.

Eczema is discussed in its modern conception as a dermatitis, varying according to circumstances and the productive agent. This is a distinct advance.

Treatment is discussed on rational lines and sufficient information is given to enable one to carry out suitable attempts at cure. Prescriptions of a sensible, desirable sort are numerous throughout the discussion of applications.

A most complete bibliography follows the description of each disease.

W. E. Eaton.

Technic of the Irrigation Treatment of Wounds by the Carrel Method, by J. Dumas and Anne Carrel. Authorised translation by Adrian V. S. Lambert, M.D., Acting Professor of Surgery in the College of Physicians and Surgeons (Columbia University), New York. With an Introduction by W. W. Keen, M.D., LL.D., F.R.C.S. (Hon.). New York: Paul B. Hoeber. Price, $1.25.

The details of Dr. Carrel's method of treating war wounds by Dakin's solution are amplified in this little brochure by his colleague, M. le Dr. J. Dumas, and the former's devoted and talented wife. It was written primarily for the information of nurses so that they might have a clear, short account of the various details of the technic, and an accurate description of the apparatus used in carrying it out. The book is not intended to supplant the more complete account written by Dr. Carrel, "The Treatment of Infected Wounds," recently reviewed in The Military Surgeon. It is simple and direct and will serve as a guide for those wishing to become proficient as-

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sistants. It is shorn of all theoretical considerations which might be confusing or be a subject of controversy. FRANCIS M. MUNSON.

A COMPEND ON BACTERIOLOGY, INCLUDING PATHOGENIC PROTOZOA, by Robert L. Pitfield, M.D., Pathologist to the Germantown Hospital, etc. Third edition. Blakiston, Quiz-Compends. Philadelphia: P. Blakiston's Son & Company Price, $1.25.

This is a new and up-to-date edition of a little book designed to serve the needs of the medical student preparing for examination and for the busy practitioner who desires to acquaint himself with the principal facts of the rapidly growing science of bacteriology. A successful effort has been made to reduce the subject matter to as concrete a form as possible. The book gives an outline of the essential accepted teachings on the subject.

Within its limits it will serve the purpose for which it is written.

FRANCIS M. MUNSON.

"NEUROSYPHILIS," by E. E. Southard, M.D., Sc.D., Bullard Professor of Neuropathology, Harvard Medical School; Pathologist, Massachusetts Commission on Mental Diseases; Director, Psychopathic Department, Boston State Hospital; Vice-President American Medicao-Psychological Association, and H. C. Solomon, M.D., Instructor in Neuropathology and in Psychiatry, Harvard Medical School; Special Investigator in Brain Syphilis, Massachusetts Commission on Mental Diseases; Acting Chief of Staff, Psychopathic Department, Boston State Hospital. With an introduction by James Jackson Putnam, M.D., Professor Emeritus of Diseases of the Nervous System, Harvard Medical School. Octavo, 496 pages, well illustrated. Boston, Mass.: W. M. Leonard, 1917.

To those who have followed the writings of these two authors for the past few years, this well-prepared volume comes as no surprise. It might aptly be described as a series of excellent clinics on nervous syphilis, including quite a satisfactory assortment of other diseases, the diagnosis of which is liable to be confused with that of syphilis. One section is devoted to "Puzzles and Errors in the Diagnosis of Neurosyphilis (including Non-syphilitic Cases)." This section is specially refreshing in view of the present rather extreme tendency to diagnose conditions as syphilitic on what would be inadequate grounds if some other disease were under consideration. The authors develop the value of careful clinical study of cases as well as post-mortem pathology in confirming or disproving diagnoses, this in contradistinction to the slipshod method of basing a diagnosis entirely upon the Wassermann reaction and often a single one at that. In obscure cases, they require three negative Wassermann reactions before accepting a negative diagnosis. Their brief remarks upon the treatment of syphilis (pp. 142 and 145) should be read by every physician who is brought into contact with this disease.

The authors draw attention to the lack of significance of the spinal fluid cell count taken as a single factor, as well as to the presence of a characteristic gold sol curve in multiple sclerosis without syphilis. It is unfortunate that, in the various case discussions, the results of the gold sol reactions have not been given in figures. A chapter on "Neurosyphilis and the War" is quite apropos. The illustrations are numerous and well chosen. M. A. REASONER.

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THE THIRD GREAT PLAGUE, a Discussion of Syphilis for Everyday People, by John H. Stokes, A.B., M.D., Chief of the Section of Dermatology and Syphilology, The Mayo Clinic, Rochester, Minn. 12 mo, 204 pages, illustrated. Philadelphia and London: W. B. Saunders Company, 1917. Cloth, $1.50 net.

The recent spread of information to the laity upon the subject of venereal diseases and the general interest aroused upon this formerly tabooed subject have brought forth a number of books intended to fill this want. It is a difficult matter to properly write such a book so as to give the right amount of information and in the proper manner. It is a pleasure to state that Dr. Stokes has handled his subject most satisfactorily. He has with great skill sailed between the Scylla of brevity and the Charybdis of profundity. This book should appeal to the general practitioner and syphilographer as well as to the laity, because it says so well the things we are often called upon for information. The chapters upon the transmission and hygiene of syphilis, the mental attitude in syphilis, and his résumé of the public activities against syphilis are well worked up. The last mentioned chapter in particular will be of value as a source of reference.

With proper safeguards, this publication can with safety be passed into the hands of the intelligent laity and, in selected cases, an undoubted benefit would be obtained by placing it at the disposal of certain unfortunates who have contracted this disease.

M. A. REASONER.

DIAGNOSIS FROM OCULAR SYMPTOMS, by M. L. Foster, M.D., F.A.C.S. New York: Rebman Company, 1917.

In reviewing this excellent work one feels the first part is rather primary to an ophthalmologist, and wonders if it is meant for the specialist or the general profession.

The remarks on ptosis are good and cover this elusive subject very well. The nomenclature on the brain might be brought up to date. The discussion of the lid conditions is excellent; practical, concise, and accurate. The section on displacements of the eye-ball suggests much; it might perhaps be more extended but there must be a limit somewhere, and this has been wisely observed. A bibliography would have greatly enhanced the value of the work.

The observations on conjugate deviation are not clear while those on the conjunctiva are excellent. The most important diagnostic points on this difficult branch of ophthalmology are clearly brought out, and in particular is this so regarding the differential diagnosis of vernal catarrah and trachoma. It presupposes very clearly, however, in this part of the work, that the student has an advanced knowledge of ophthalmology. Folliculosis and follicular conjunctivitis is an excellent clinical division and one of practical value.

The conception of tuberculosis of the conjunctiva is good, that of interstitial keratitis the clearest that could be imagined, but that of ulcer of the cornea is meager.

It is advised that a tenometer should not be used in plastic iritis, its use simply impressing the patient, as would a theatrical performance. This point

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is not at all well taken. If we need the information as to the tension of the eye nothing short of actual damage to that organ should deter one from making this important examination.

The remarks on iritis are excellent, the differential diagnosis in particular, while those on cataract, glaucoma, and sympathetic inflammation are concise, and not too qualified and voluminous, as accounts of these conditions are apt to be.

The section devoted to spots on the fundus are not satisfying, but those sections devoted to tumor of the fundus, glioma, pseudo glioma, and tuberculoma, together with detached retina, are very good indeed.

The discussion of hemianopsia is practical and valuable more particularly for the reason that it does not undertake extended discussion of the condition, bearing in mind, no doubt, that the student can go to the works on neurology for this.

The author states it can scarcely be likely that neuralgia (trigeminal) can come from eye strain. It is most assuredly one of the many etiological factors of this condition. The remarks on our shortcomings in refraction work are refreshingly frank; the dissertation on eye strain is full of good common sense spiced with accurate scientific knowledge and practical experience.

Withal, it is a most readable book, one that we may peruse with pleasure and profit.

WM. T. DAVIS.

INTERNATIONAL CLINICS, a Quarterly of Illustrated Clinical Lectures and Especially Prepared Original Articles on Treatment, Medicine, Surgery, Neurology, Baediatrics, Obstetrics, Gynecology, Orthopedics, Pathology, Dermatology, Ophthalmology, Otology, Rhinology, Laryngology, Hygiene, and other topics of interest to Students and Practitioners, by Leading Members of the Medical Profession throughout the World. Vol. iii, Twenty-seventh Series, 1917. Philadelphia and London: J. B. Lippincott Company.

A medical book issued as a series, that can continue in existence and popularity well into the twenty-seventh series, must have had, and hold, an enviable position in current medical literature. The latest contribution, Volume iii, explains the popularity of the publication. First, there is a series of clinics by men of recognised ability, the subjects presented covering a wide field of general medicine and surgery, including an up-to-date article upon the part that focal infections may play. There is a good article upon the clinical value of arterial blood pressure, as well as several others upon topics of special interest, including "Notes on Tetanus in the War of 1914" and another, "Neurasthenia before and after the War." Under the heading *Surgery* are to be found several articles of special value, more particularly one by Wayne Babcock on "Experiences in Reconstructive Surgery of the Extremities," one of the very best papers on this topic that has appeared in any publication. For the general practitioner as well as for the specialist who wants to keep informed of the science and art of medicine from the clinical side, the *International Clinics* unquestionably has a valuable place.

JNO. E. SUMMERS.

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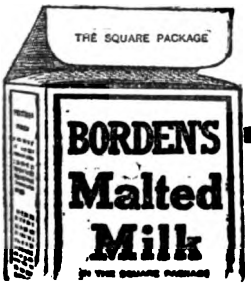

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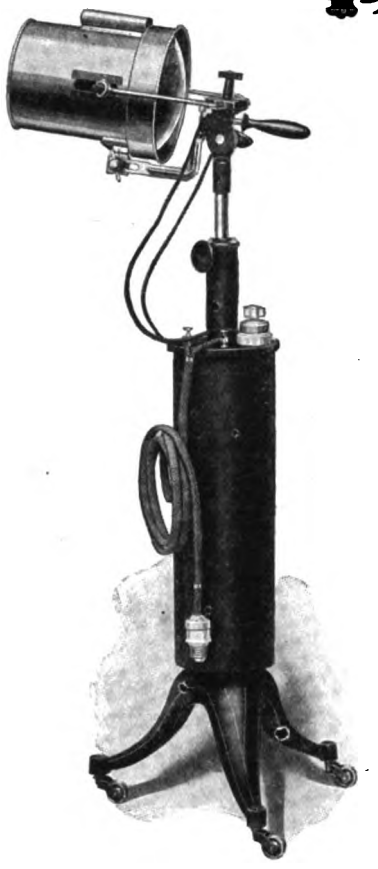

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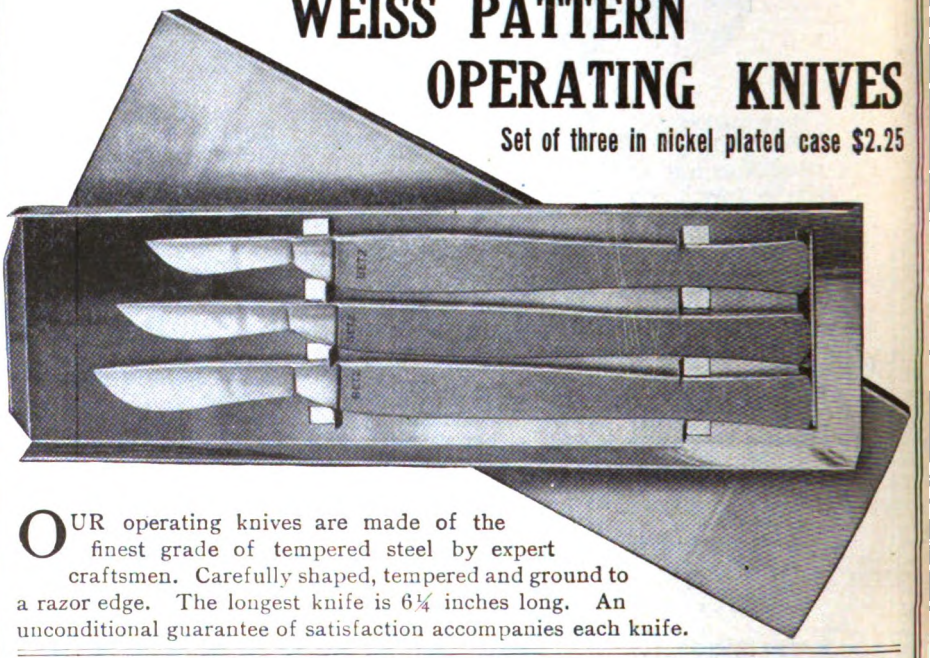

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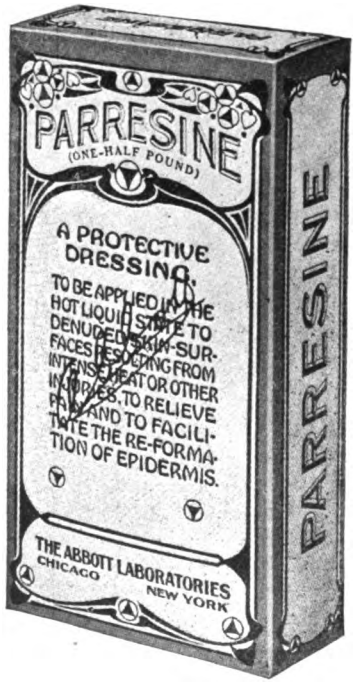
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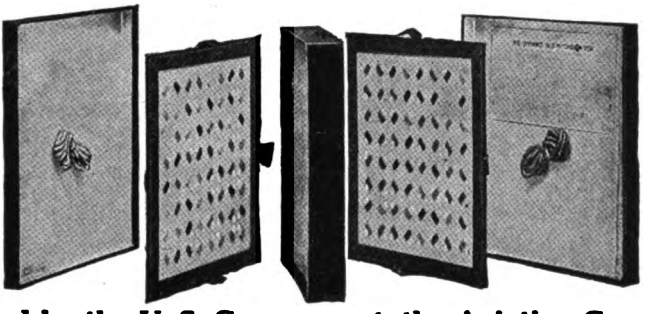

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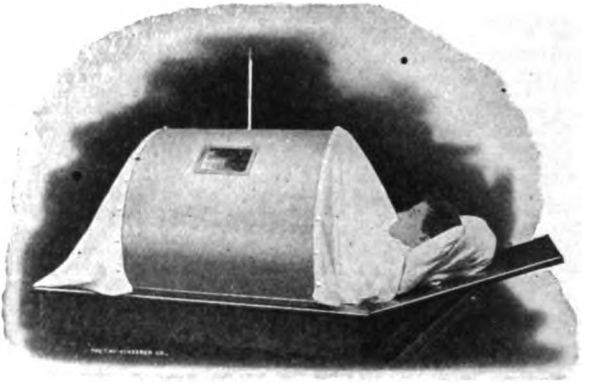

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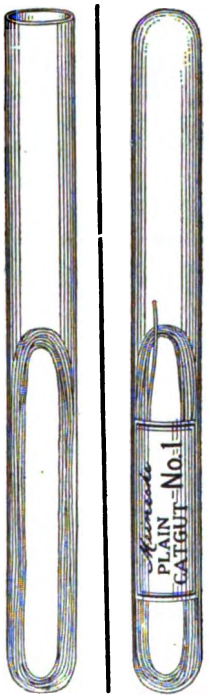

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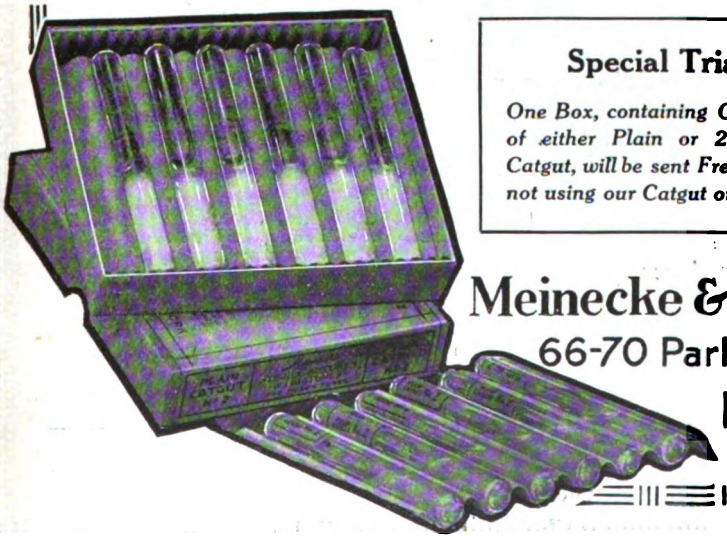

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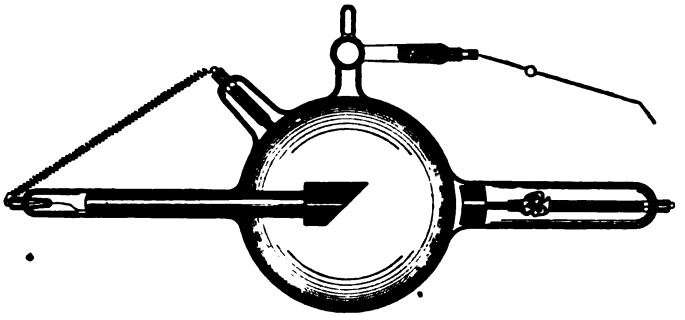

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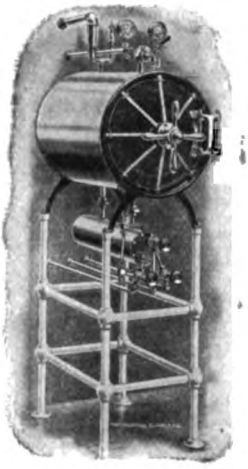

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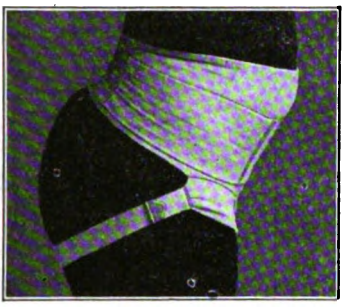

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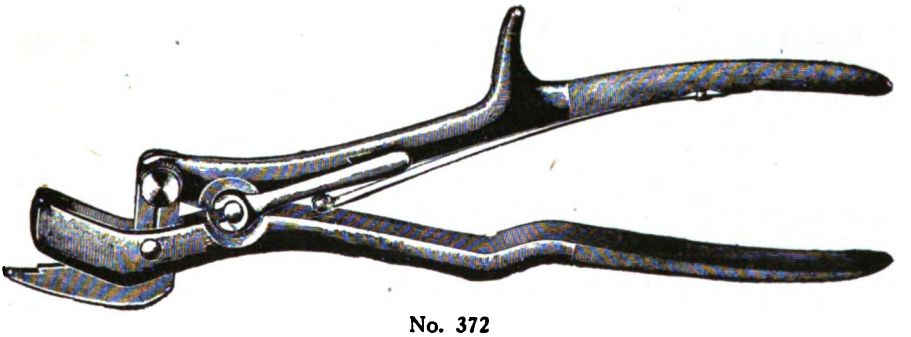

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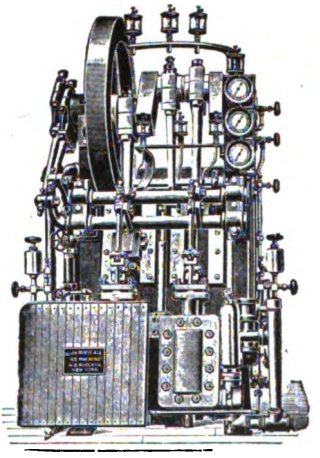

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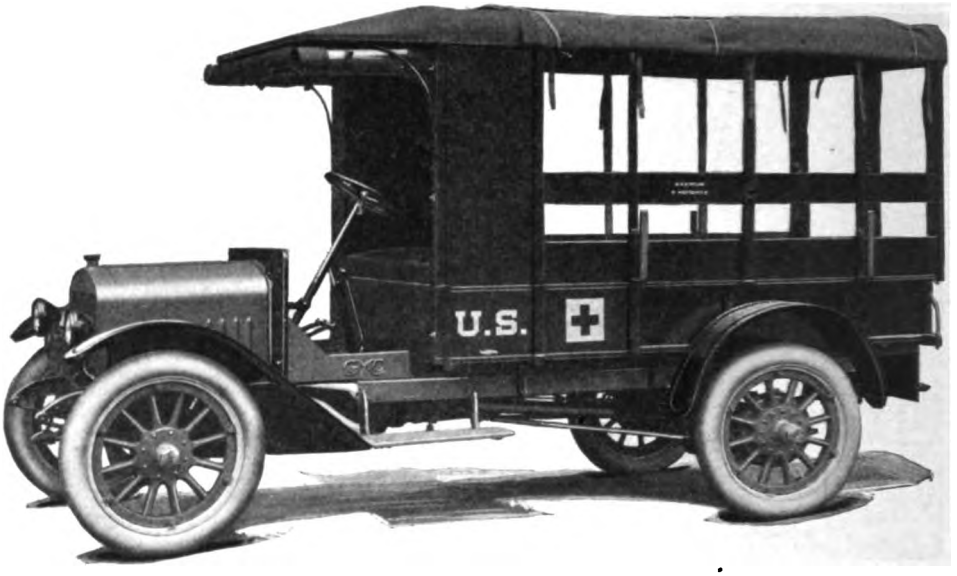

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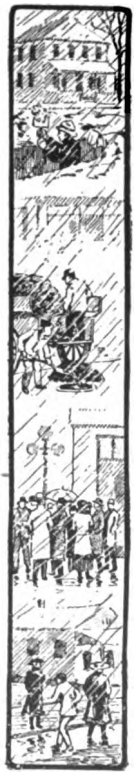

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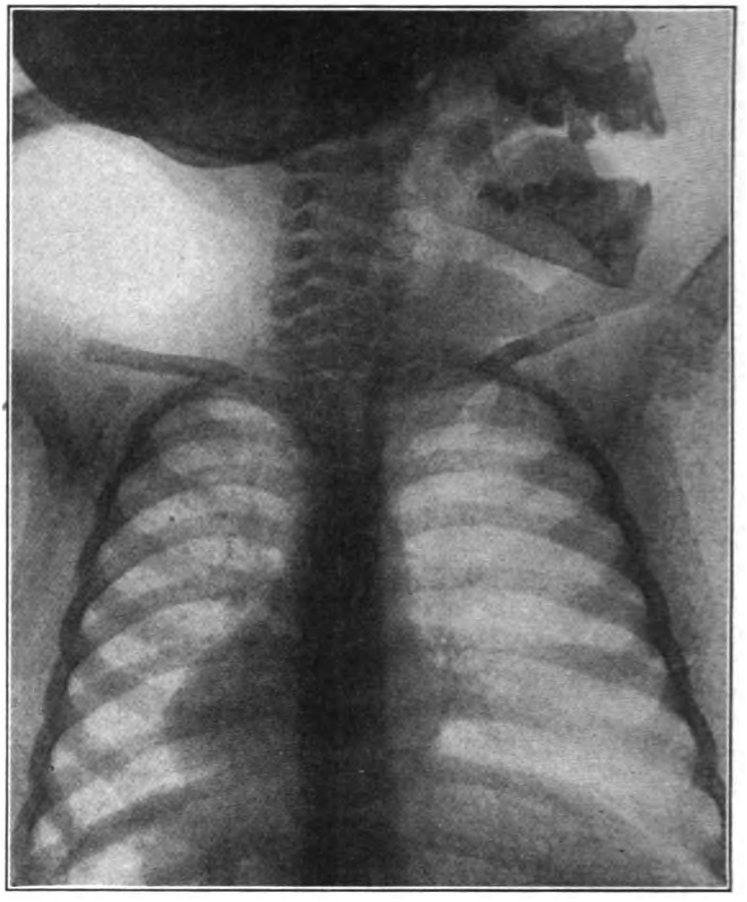

THIS is from an Eastman X-Ray Film negative made at the Rochester General Hospital, with an intensifying screen, in 1/60 of a second. Note the penetration.

For sale by all supply houses. Pamphlet on request.

EASTMAN KODAK CO., Rochester, N. Y.

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Starch dissolves in perspiration, decomposes and becomes an irritant.

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FASTEP FOOT POWDER protects the skin, prevents irritation, promotes comfort, overcomes excessive perspiration, deodorizes, is soothing and healing.

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KORA-KONIA meets the demands of modern scientific Surgery. In all cases where a dependable dusting powder is indicated KORA-KONIA never disappoints. Its antacid, haemostatic, mildly astringent and moisture-resisting qualities recommend it for many surgical uses as well as in the treatment of burns, blisters, raw surfaces, suppurative conditions, slow-healing wounds, minor operations, dermatitis, intertrigo, poison ivy and local skin affections.

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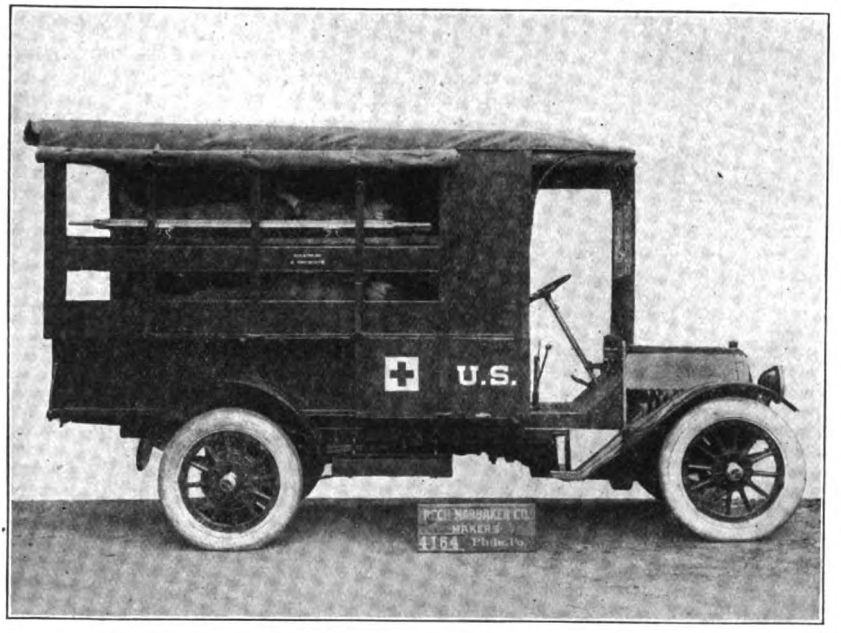

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